

## **Original instructions**



### **AVANTI SERVICE LIFT**

User's, Maintenance and Installation Manual

Model Service Lift DOLPHIN





# CERTIFICATE

## EC Type Examination

EC-Directive 2006/42/EC, Article 12, Section 3b  
Machinery

Number of registration: 01/205/0799B/13

Certification body for machinery NB0035  
at TÜV Rheinland Industrie Service GmbH  
herewith confirms for the company

**AVANTI WIND SYSTEMS A/S**

Høgevej 19  
DK- 3400 Hillerød  
Denmark

the close conformity of the product

**Service lift inside wind turbine**  
**from VESTAS (V66, V80, V90, V100, V112, V117, V126, V164) including protection**  
**fences for service lift holes at landings and fence door interlock system**

### Technical data:

Type:	Dolphin	Dolphin 350
- max. load capacity:	240 kg / 2 persons	350 kg / 2 persons
- net weight:	160 kg	180 kg
- traction hoist:	M500 or M508	M508 (version 600 kg)
- safety gear:	OSL500 or ASL508	ASL508 (version 600 kg)
- max. lifting height:	180 m	150 m
- lifting speed:	18 m/min	
- Protection fences:	Swinging door or sliding door with interlock system, or fixed fence	
- Fence Interlock system:	Guard locking switch system or Trapped-key system	

Modification B to the certificate 01/205/0799A/12 from 2012-10-28  
- New lift model with a lift capacity of 350 kg

with the requirements according to annex I of Directive 2006/42/EC about machinery and amending the Directive 95/16/EC of the European Parliament and the Council from May 2006 for adaptation of legal and administration regulations of the member countries regarding safety of machinery.

The verification was proved by EC-type approval test, Test-Report- No.: 13\_049-1 from 2013-09-30 and is valid only duly considering the requirements mentioned in this document. The examination was realized on site in Zaragoza, Spain.

This certificate is valid until 2018-10-02

Cologne, 2013-10-02



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Certification body  
Notified under No. 0035  
certifier

Dipl.-Ing. Walter Ringhausen

**TÜV Rheinland®**  
Precisely Right.



# CERTIFICATE

## EC Type Examination

EC-Directive 2006/42/EC, Article 12, Section 3b  
Machinery

Number of registration: 01/205/0869/15

Certification body for machinery NB0035  
at TÜV Rheinland Industrie Service GmbH  
herewith confirms for the company

**AVANTI WIND SYSTEMS A/S**  
**Rønnevangs Allé 6**  
**DK- 3400 Hillerød**  
**Denmark**

the close conformity of the product

**Service lift inside wind turbine**  
**with protection fences for service lift holes at landings**  
**and fence door interlock system**

### Technical data:

<b>Type:</b>	<b>Dolphin A</b>
- max. load capacity:	240 kg / 2 persons
- net weight:	160 kg
- traction hoist:	M508
- safety gear:	ASL508
- max. lifting height:	180 m
- lifting speed:	18 m/min
- Protection fences:	Swinging door or sliding door with interlock system or fixed fence
- Fence Interlock system:	Guard locking switch system or Trapped-key system

with the requirements according to annex I of Directive 2006/42/EC about machinery and amending the Directive 95/16/EC of the European Parliament and the Council from May 2006 for adaptation of legal and administration regulations of the member countries regarding safety of machinery.

The verification was proved by EC-type approval test, Test-Report- No.: 15\_029-1 from 2015-04-09 and is valid only duly considering the requirements mentioned in this document. The examination was realized on site in Zaragoza, Spain.

This certificate is valid until 2020-04-13

Cologne, 2015-04-13



Certification body  
Notified under No. 0035  
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Certificate of Dolphin V AECO 240 version



UL LLC

Presents this

## AECO CERTIFICATE

Certificate No. 2013042912CA15816

Date: 2013-04-29

To

**Avanti Wind Systems Inc.  
5150 South Towne Drive  
New Berlin, WI 53151 USA**

For certification in accordance with the ASME A17.7-2007/CSA B44.7-07 of the following Elevator Subsystem:

**Turbine Service Lift**

(See addendum for details)

**Effective from: April 29, 2013 Until April 29, 2016**

Issued by: Daniel Posner  
AECO Certification Services

Reviewed by: Len Grant  
AECO Certification Services

Reviewed by: William N. Bartunek, PE  
AECO Certification Services

*Please look for the UL Classification Mark and Certificate Number on the product*

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# Contents

	Page
<b>1. Limited warranty.</b>	<b>8</b>
<b>2. Introduction.</b>	<b>9</b>
2.1 Observations	9
2.2 Symbols	9
2.3 Cautions	10
<b>3. Description</b>	<b>11</b>
3.1 Purpose	11
3.2 Scope	11
3.3 Exclusions	11
3.4 Technical specifications	11
3.5 Dimensions	12
3.6 Components	13
3.6.1 For Dolphin V CE and AECO versions	13
3.6.2 For Dolphin A version	14
3.7 Traction system	15
3.8 Fall arrest device	15
3.9 Traction, safety and guiding wire ropes.	15
3.10 Main control box	16
3.11 Cabin control box.	16
3.11.1 For Dolphin V CE and AECO versions	16
3.11.2 For Dolphin A CE version	16
3.12 Bottom platform control box.	17
3.12.1 For Dolphin V CE versions with guard locking	17
3.12.2 For Dolphin V CE versions with trapped key and for AECO version	17
3.12.3 For Dolphin A CE version	17
3.13 Intermediate and top platform control box for Dolphin A CE version	17
3.14 Platform fences	18
3.14.1 Fences for Dolphin V and A CE versions	18
3.14.2 Fences for Dolphin V AECO version	19
3.15 Service lift door	20
3.16 Emergency top limit switch	21
3.17 Top obstruction device	21
3.18 Bottom obstruction device	21
3.19 Manual descent system.	22
3.20 Fall arrest device	22
3.21 Overload limiter	23
3.22 Slack rope sensor	23
3.23 Warning light	23
3.24 Acoustic buzzer	23
3.25 Anchor points.	23
3.26 Internal light	23
3.27 Lateral removable windows for Dolphin A version	23
3.28 Front fixed window for Dolphin A version	24
3.29 Travelling cable pulley.	24
3.30 CCV sticker	24
<b>4. Installation</b>	<b>25</b>
4.1 WTG integration requirements	25
4.2 Cautions	25
4.3 Electrical connections	25
4.3.1 Power cable.	25
4.3.2 Guard locking system	26
4.4 Guiding, traction and safety wire ropes.	26
4.4.1 Top platform	26
4.4.2 Bottom platform	27
4.5 Wire rope fix	28
4.6 Danger zone sticker.	28
4.7 Inspection before first use	28

<b>5. Instructions for use</b>	<b>29</b>
5.1 Prohibited uses	29
5.2 Operation from inside the cabin (manual)	29
5.3 Operation from outside the cabin (automatic)	29
5.3.1 Bottom platform	29
5.3.2 Top platform	29
5.4 Operation from the platform control boxes	29
5.5 Fall arrest device	29
5.6 Manual descent	30
5.7 Lateral removable windows for Dolphin A version	30
5.8 Troubleshooting	31
5.9 Out of service	34
<b>6. Maintenance</b>	<b>34</b>
6.1 Planning	34
6.2 Cautions	34
6.3 Daily inspection	34
6.4 Annual inspection	35
6.4.1 Cabin	35
6.4.2 Traction hoist	35
6.4.3 Fall arrest device	36
6.4.4 Traction, safety and guiding wire ropes	36
6.4.5 Repairs	38
6.4.6 Overload check and adjustment	38
6.5 Information signs and documents	38
6.6 Ordering spare parts	38
<b>Appendix A: Adjustment of the overload limiter</b>	<b>39</b>
<b>Appendix B: Safety measures</b>	<b>41</b>
<b>Appendix C: Inspection Checklist</b>	<b>42</b>
<b>Appendix D: Inspection Log Sheet</b>	<b>46</b>
<b>Appendix E: AVANTI lift anchor</b>	<b>48</b>



# 1. Limited Warranty

Avanti Wind Systems A/S warrants that commencing from the date of shipment to the Customer and continuing for a period of the longer of 365 days thereafter, or the period set forth in the standard AVANTI warranty, the Product<sup>1)</sup> described in this Manual will be free from defects in material and workmanship under normal use and service when installed and operated in accordance with the provisions of this Manual.

This warranty is made only to the original user of the Product. The sole and exclusive remedy and the entire liability of Avanti under this limited warranty, shall be, at the option of Avanti, a replacement of the Product (including incidental and freight charges paid by the Customer) with a similar new or reconditioned Product of equivalent value, or a refund of the purchase price if the Product is returned to Avanti, freight and insurance prepaid. The obligations of Avanti are expressly conditioned upon return of the Product in strict accordance with the return procedures of Avanti.

This warranty does not apply if the Product (i) has been altered without the authorization of Avanti or its authorized representative; (ii) has not been installed, operated, repaired, or maintained in accordance with this Manual or other instructions from Avanti; (iii) has been subjected to abuse, neglect, casualty, or negligence; (iv) has been furnished by Avanti to Customer without charge; or (v) has been sold on an "AS-IS" basis.

Except as specifically set forth in this Limited Warranty,

ALL EXPRESS OR IMPLIED CONDITIONS, REPRESENTATIONS AND WARRANTIES, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTY OR CONDITION OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, NON-INFRINGEMENT, SATISFACTORY QUALITY, COURSE OF DEALING, LAW, USAGE OR TRADE PRACTICE ARE HEREBY EXCLUDED TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW AND ARE EXPRESSLY DISCLAIMED BY AVANTI. IF, PURSUANT TO ANY APPLICABLE LAW, TO THE EXTENT AN IMPLIED WARRANTY CANNOT BE EXCLUDED AS PROVIDED IN THIS LIMITED WARRANTY, ANY IMPLIED WARRANTY IS LIMITED IN TIME TO THE SAME DURATION AS THE EXPRESS WARRANTY PERIOD SET FORTH ABOVE. BECAUSE SOME STATES DO NOT PERMIT LIMITATIONS ON THE DURATION OF IMPLIED WARRANTIES, THIS MAY NOT APPLY TO A GIVEN CUSTOMER. THIS LIMITED WARRANTY GIVES CUSTOMER SPECIFIC LEGAL RIGHTS, AND CUSTOMER MAY HAVE OTHER LEGAL RIGHTS UNDER APPLICABLE LAWS.

This disclaimer shall apply even if the express warranty fails of its essential purpose.

In any cases of dispute the English original shall be taken as authoritative.

<sup>1)</sup>Avanti service lift ("Product")



## 2. Introduction

### 2.1 Observations

**Only trained people may use this lift.**

This manual must be available to staff at all times during installation, maintenance and operation. Additional copies are available from the manufacturer upon request.

All measurements are indicative only and subject to change without notice.



*The pictures and sketches in this manual may not reflect the product aesthetics, colours, arrangement precisely. This has no impact on the function or safety.*

### 2.2 Symbols

Symbol	Signal word	Meaning	Possible injury if not observed
--------	-------------	---------	---------------------------------

#### Safety instructions



**DANGER!**

IMMEDIATE or possibly imminent danger:

Death or severe injury!



**DANGER!**

IMMEDIATE or possibly imminent danger of hazardous voltage:

Death or severe injury!



**CAUTION!**

Potentially hazardous situation:

Light injury or material damage.

#### Additional instructions



**ATTENTION!**

Potentially dangerous situation:

Damage to equipment or workplace



**IMPORTANT!**

Useful tips for optimum working procedure

None



**VERSION!**

Differentiation between CE versions and AECO version.



Reference to written specification/documentation

## 2.3 Cautions

Use and daily inspection of the service lift shall only be performed by AVANTI or personnel authorised by AVANTI, hired by the employer for the job at hand. Installation and maintenance of the service lift shall only be performed by AVANTI or qualified personnel authorised by AVANTI, hired by the employer for the job at hand. Additionally, these tasks may be performed by qualified personnel authorised by a trainer authorised by AVANTI.

Personnel must be at least 18 years of age. The staff must be familiar with the relevant accident prevention instructions and must have received proper training in these.

Personnel are obliged to read and understand this User's Manual.

Personnel shall wear PPE (safety helmet, full body harness, shock absorber, lanyard and slider) at all times.

A copy of the User's Manual must be handed out to the personnel and must always be available for reference.

If more than one person is entrusted with one of the above tasks, the employer shall appoint a supervisor in charge of the operation.

Self-locking nuts must be used at all times. The screw must extend from the nut by at least half of the thread diameter. The nut may not be used once it has become possible to loosen by hand!

If any damage or faults are found during operation, or if circumstances arise which may jeopardize safety: immediately interrupt the work in progress and notify the supervisor or employer!

All tests/repairs of electrical installations may only be performed by AVANTI or qualified personnel authorised by AVANTI.

All repairs to the traction, braking and supporting systems may only be performed by AVANTI or qualified personnel authorised by AVANTI.

If any supporting parts are repaired or replaced, the operational safety of the system must be tested and verified by AVANTI or qualified personnel authorised by AVANTI.

Only original fault-free parts may be used.

Use of non-original parts will render the manufacturer's warranty void and any type approval invalid. No modification, extension or reconstruction of the

service lift is allowed without the manufacturer's prior written consent.

No warranty is provided against damage resulting from reconstruction or modification of equipment or use of non-original parts which are not approved by the manufacturer.

Service lift must be inspected by AVANTI or by qualified personnel authorised by AVANTI before first use.

Service lift must be inspected at least once a year by AVANTI or qualified personnel authorised by AVANTI. In case of high operating frequency or severe conditions of use, more frequent inspection is required.

Service lift is designed for a lifetime of 20 years with an operating frequency of approximately 12.5 h/year (250 h in total).

Service lift may not be used by persons who are under the influence of alcohol or drugs which may jeopardize working safety.

Service lift shall ONLY be used when the turbine is not generating power.

All wind farm site specific rules must be followed. Service lift shall not be used during inclement weather, including wind speeds over 25 m/s (55.5 mph).



*Personnel of Dolphin AECO version shall be equipped with a wired or wireless two way communication device connected to a location staffed by authorized personnel.*



*Avoid injury – follow all instructions!*



*The tower owner must verify the need for third party service lift inspections with the local authority and comply with the standards specified.*

## 3. Description

### 3.1 Purpose

The service lift purpose is to transport persons plus their tools and equipment to the most convenient height for performing work in wind turbine generators (WTG).

Its use is limited to AVANTI or personnel authorised by AVANTI holding the relevant training certificates. The access to the WTG and consequently to the service lift is controlled and forbidden to public access.

The service lift is used primarily to transport technicians, their tools and spare parts from the bottom platform (or lowest accessible point) to the top platform (or highest accessible point). It is also used to access intermediate platforms where inspection and service of WTG connecting bolts and other equipment is made.

### 3.2 Scope



*This manual contains instructions for four different versions of the Dolphin lift:*

- Dolphin V CE 240 version.
- Dolphin V CE 350 version.
- Dolphin A CE 240 version.
- Dolphin V AECO 240 version.



*The Dolphin V CE versions are CE certified to the Machinery Directive 2006/42/EC.*



*The Dolphin V AECO version is AECO certified to ASME A17.7/CSA B44-7.*

The product details are described along this manual. The product consists of:

- A service lift, which is formed by: a cabin, a traction system, a fall arrest device, a control system, and safety devices.
- A guiding system along the tower, which is formed by: a pair of steel guiding wire ropes, wire fixes attached to the tower, and guides on the service lift.

### 3.3 Exclusions

The service lift shall not be used outdoor or in potentially explosive atmospheres. The service lift is not designed to carry a person on its top. The wind turbine manufacturer is responsible of integrating the service lift and ensuring compliance with the essential health and safety requirements as stated on the 2006/42/EC Machinery Directive and the applicable harmonized standards following AVANTI's recommendations.

This will require supply of interface components, including but not limited to:

- Platform fences.
- Power supply protection.
- An evacuation way (e.g. ladder)

### 3.4 Technical specifications



*A third party approval of the final integration might be required depending on the national regulations.*

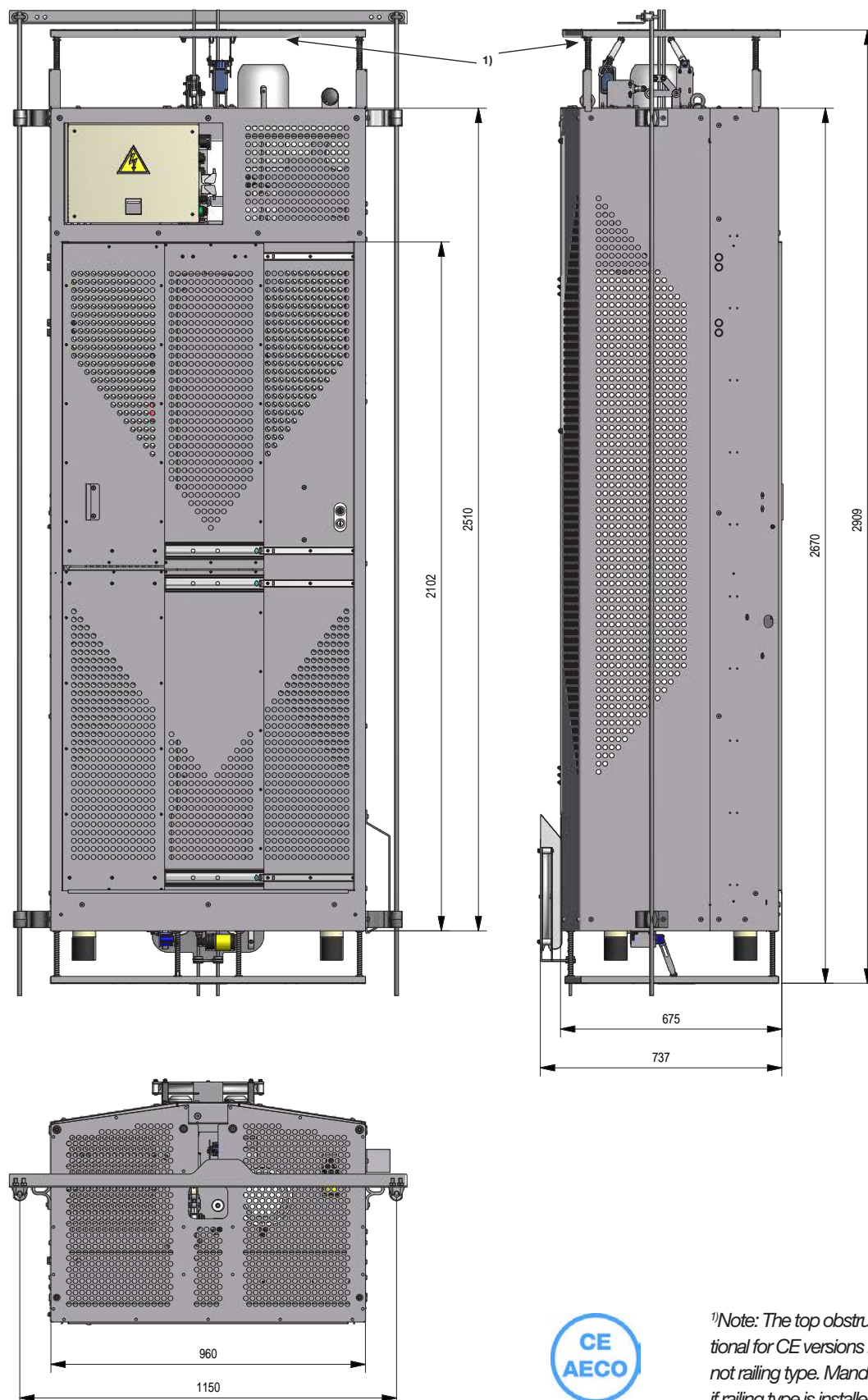
The wind turbine manufacturer shall also provide any additional relevant warning, instruction and / or training specific to the integration of the service lift necessary for its safe and correct installation.



*Tower manufacturer's risk assessment shall include a service lift integration study.*

Service lift	Dolphin V CE 240	Dolphin V CE 350	Dolphin A CE 240	Dolphin V AECO 240
Service lift weight	165 kg	180 kg	165 kg	165 kg
Service lift speed	10 or 18 or 21 m/min ± 10 %	18 m/min ± 10 %	18 m/min ± 10 %	10 or 21 m/min ± 10 %
Working load limit / N° persons (max)	240 kg / 2 Persons	350 kg / 2 Persons	240 kg / 2 Persons	240 kg / 2 Persons
Operating temperature	-15°C to +60°C (5°F to +140°F)	-15°C to +60°C (5°F to +140°F)	-15°C to +60°C (5°F to +140°F)	-15°C to +60°C (5°F to +140°F)
Survival temperature	-25°C to +80°C (-13°F to +176°F)	-25°C to +80°C (-13°F to +176°F)	-25°C to +80°C (-13°F to +179°F)	-25°C to +80°C (-13°F to +176°F)
Max. Noise level	80 dB (A)	80 dB (A)	80 dB (A)	80 dB (A)
Wire rope fastenings	Shackle 2T form C with safety pin	Shackle 2T form C with safety pin	Shackle 2T form C with safety pin	Shackle 2T form C with safety pin
Power supply	3 Phase 400V / 480V / 690V, 50Hz / 60Hz	3 Phase 400V / 690V, 50Hz / 60Hz	3 Phase 400V / 690V, 50Hz / 60Hz	3 Phase 400V / 480V, 60Hz
Power cable	Dolphin V CE 240	Dolphin V CE 350	Dolphin A CE 240	Dolphin V AECO 240
Type	5G1.5 (400V) / 5G1.5 (480V) / 4G1.5 (690V)	5G1.5 (400V) / 4G1.5 (690V)	12G2.5 (400V / 690V)	5G1.5 (400V) / 5G1.5 (480V)
Weight (approx.)	0.16 kg/m	0.16 kg/m	0.53 kg/m	0.16 kg/m

### 3.5 Dimensions

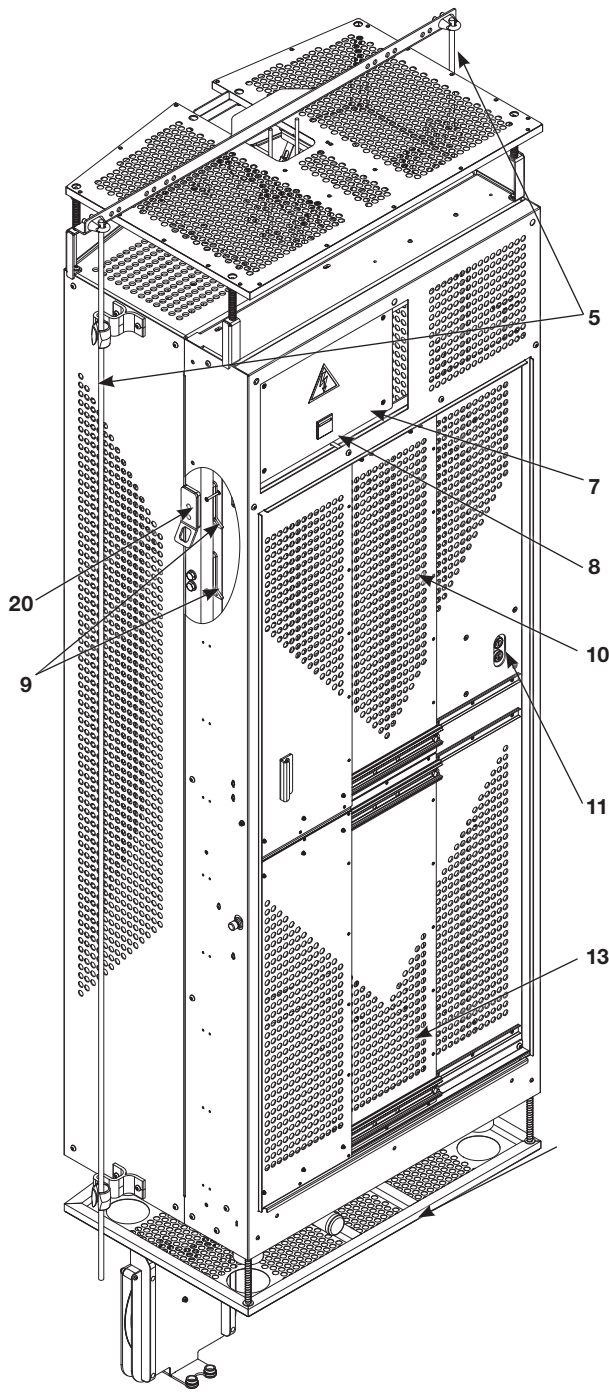


<sup>1)</sup>Note: The top obstruction device is optional for CE versions if platform fences are not railing type. Mandatory for CE versions if railing type is installed. Mandatory for AECO versions.

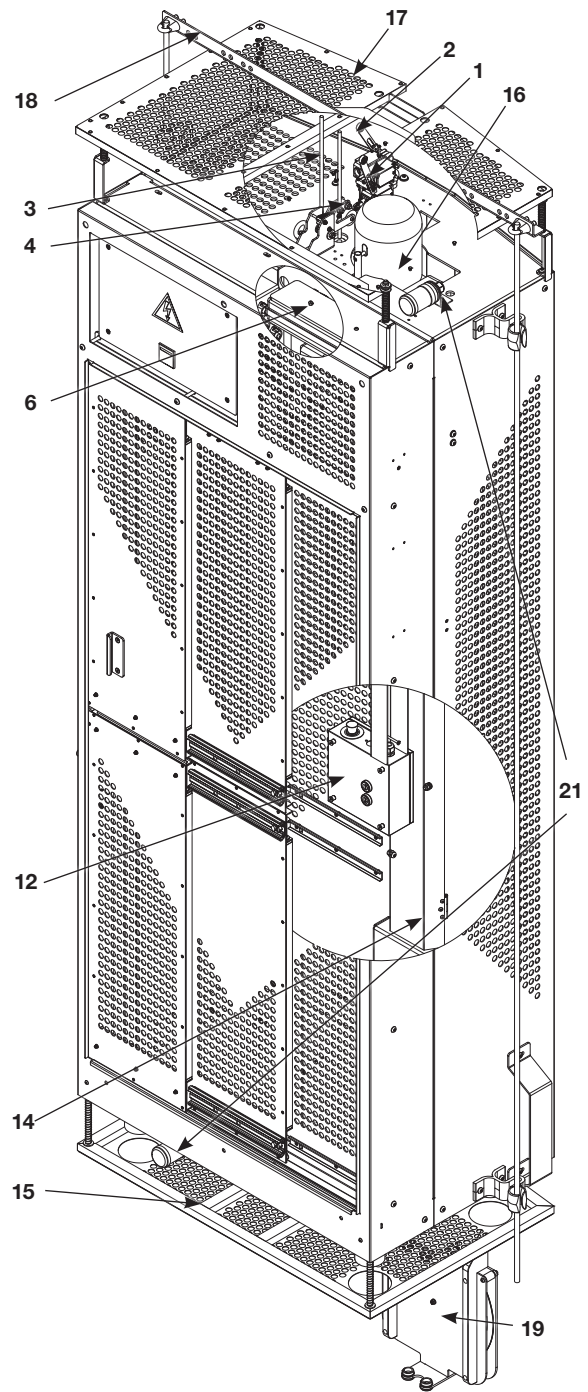


## 3.6 Components

### 3.6.1 For Dolphin V CE and AECO versions



1. Emergency top limit stop switch
2. Top limit switch
3. Safety wire rope
4. Traction wire rope
5. Guiding wire ropes
6. Internal Light
7. Main control box
8. Hour counter
9. Anchor points
10. Top sliding door

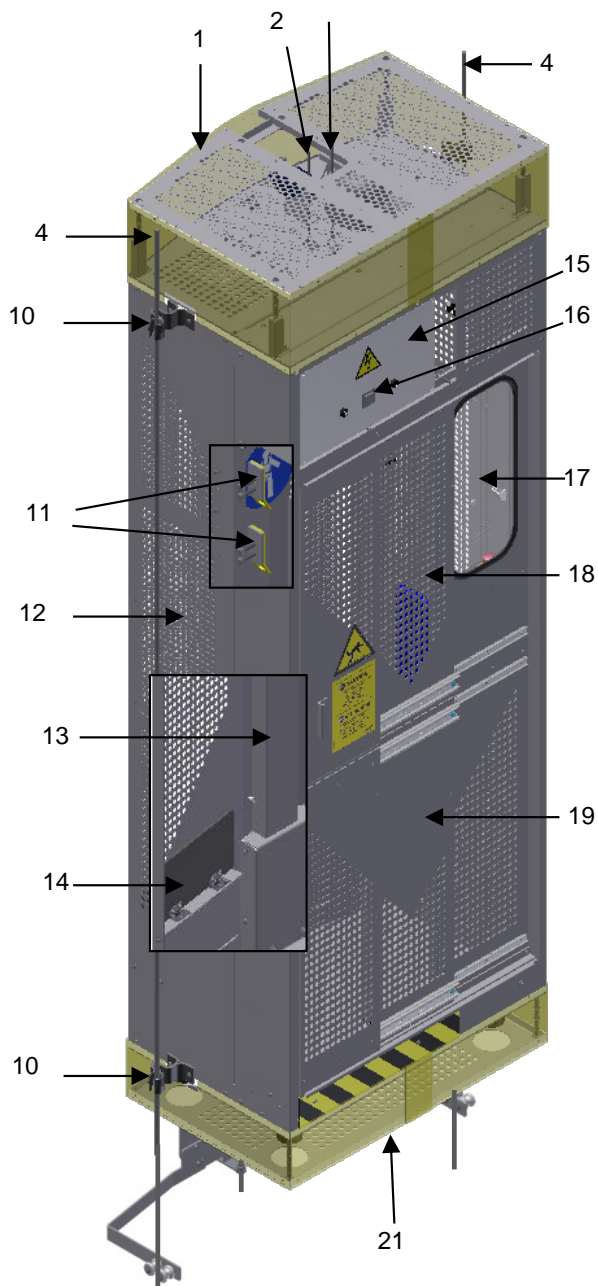


11. External controls
12. Cabin control box
13. Bottom sliding door
14. Maintenance cover
15. Bottom obstruction device
16. Traction hoist and fall arrest device
17. Top obstruction device <sup>1)</sup>
18. Top stop bar <sup>1)</sup>
19. Travelling cable pulley <sup>1)</sup>
20. External anchor point (optional)
21. Warning lights <sup>1)</sup>

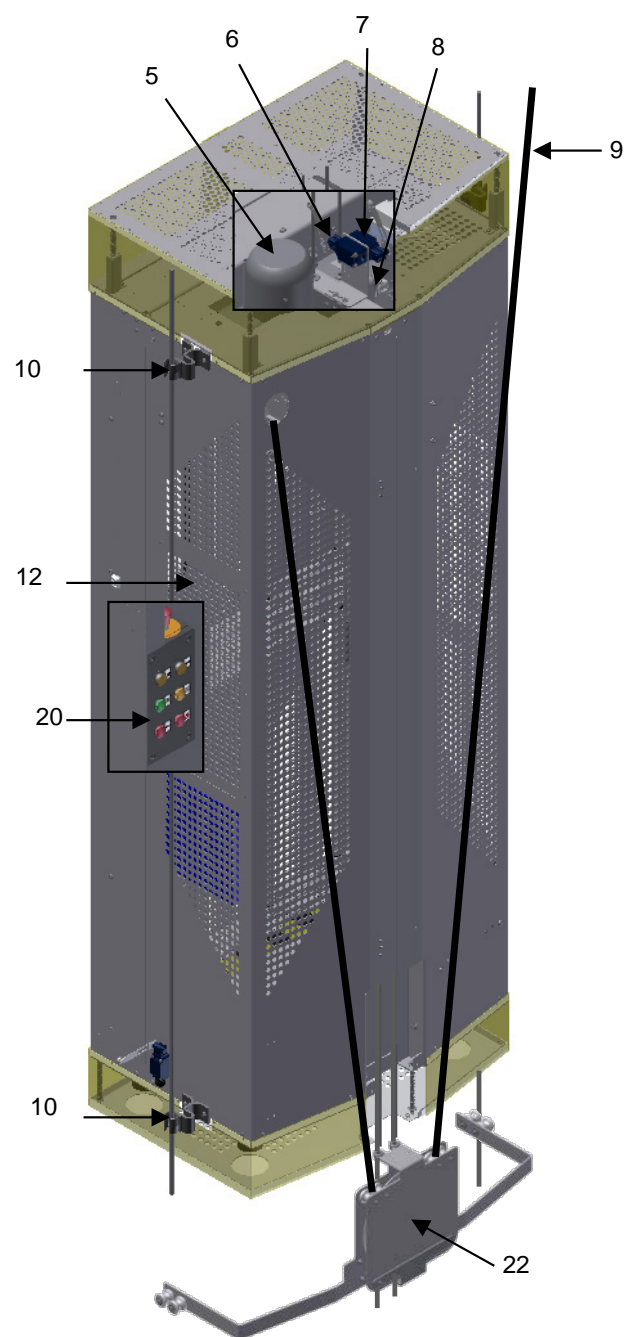


<sup>1)</sup> Note: Optional for CE versions. Mandatory for AECO version.

### 3.6.2 For Dolphin A version



- 1. Top obstruction device
- 2. Safety wire rope
- 3. Traction wire rope
- 4. Guiding wire rope (2x)
- 5. Traction hoist
- 6. Top obstruction switch
- 7. Emergency top limit switch (S13)
- 8. Fall arrest device
- 9. Travelling cable
- 10. Wire rope guide (4x)
- 11. Anchor point (2x)
- 12. Lateral removable window (2x)
- 13. Maintenance cover
- 14. Folding step



- 5. Traction hoist
- 6. Top obstruction switch
- 7. Emergency top limit switch (S13)
- 8. Fall arrest device
- 9. Travelling cable
- 10. Wire rope guide (4x)
- 11. Anchor point (2x)
- 12. Lateral removable window (2x)
- 13. Maintenance cover
- 14. Folding step
- 15. Main control box
- 16. Hour counter
- 17. Front fixed window
- 18. Top sliding door
- 19. Bottom sliding door
- 20. Cabin control box
- 21. Bottom obstruction device
- 22. Travelling cable pulley

### Traction system



### Fall arrest device



### 3.7 Traction system

Service Lift	Hoist	Lifting capacity	Wire rope speed	Effect	Rated current	Traction wire rope Ø	Unit weight approx.
Version	Traction system type	Kg	m/min	kW	A	mm	Kg
Dolphin CE	M500-M508/400V	500	18	1.5	4.1	8.4	50
Dolphin CE	M500-M508/690V	500	18	1.5	2.3	8.4	50
Dolphin AECO	M508/400V	500	21.4	1.8	4.9	8.4	50
Dolphin CE 350	M508 / 400V 50Hz/60Hz	600	18	2	4.4 / 5.3	8.4	55
Dolphin CE 350	M508 / 690V 50Hz/60Hz	600	18	2	2.6 / 3.2	8.4	55

### 3.8 Fall arrest device

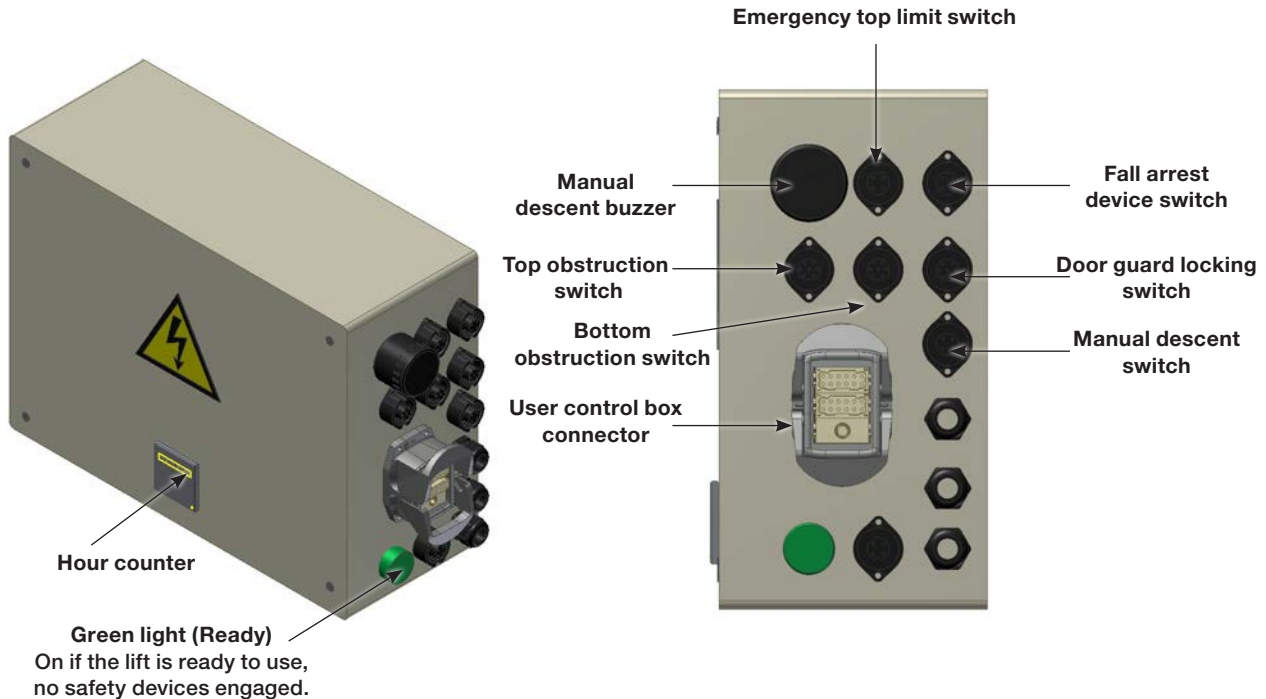
Service Lift	Fall arrest device	Lifting capacity	Triggering speed	Safety wire rope Ø	Unit weight approx.
Version	Type	Kg (lbs)	m/min (ft/min)	mm	Kg (lbs)
Dolphin CE	OSL 500 - ASL 508	500 (1100)	30 (100)	8.4	7 (15.4)
Dolphin AECO	ASL 508	500 (1100)	30 (100)	8.4	7 (15.4)
Dolphin CE 350	ASL 508	600 (1320)	30 (100)	8.4	7 (15.4)

### 3.9 Traction, safety and guiding wire ropes

Service Lift Version	Wire rope type	Wire rope diameter	Surface Treatment	Mark/feature	Min. break resistance	Attached with
Dolphin CE	M500 / OSL 500	8.4 mm, 5x19	HDG	no	55 kN	2 t shackle
Dolphin CE & AECO	M508 / ASL 508	8.4 mm, 5x19	HDG	no	55 kN	2 t shackle
Dolphin CE 350	M508 / ASL 508	8.4 mm, 5x19	HDG	no	59 kN	2 t shackle
ALL	Guiding wire rope	12 mm	HDG	no	53 kN	2 t shackle

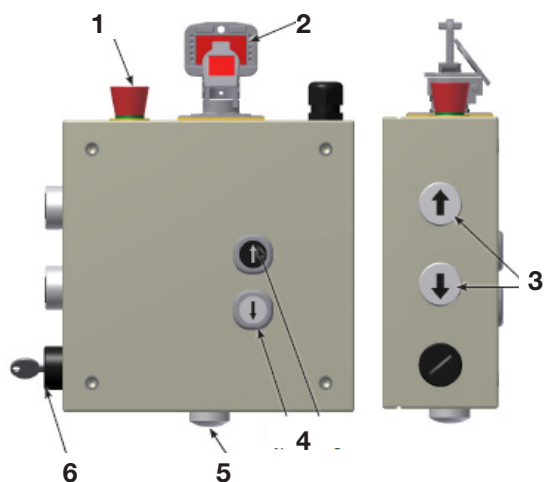


### 3.10 Main control box



### 3.11 Cabin control box

#### 3.11.1 For Dolphin V CE and AECO versions



1. Emergency stop button. Press it to interrupt any control function. Pull to reset the control after necessary verifications.

2. Trapped key switch <sup>1)</sup>. Insert and turn the key to the ON position to enable control of the lift. The key is now trapped and cannot be removed until it is turned back to the OFF position. Turn and remove the key to interrupt control of the lift. Then use the key to open the trapped key lock of the top platform fence.

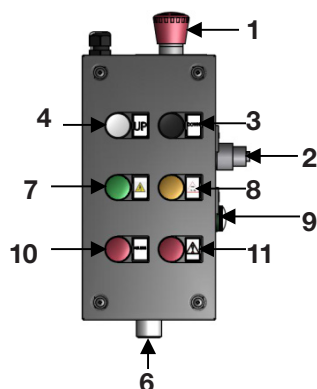
3. UP/DOWN buttons (hold to run)

4. UP/DOWN buttons (automatic send). Press it to send the lift all the way to the top or bottom of the tower. The automatic DOWN button is only operational from the top platform and the automatic UP button is only operational from the bottom platform.

5. Overload buzzer. It sounds when the cabin is overloaded.

6. Bottom obstruction override switch

#### 3.11.2 For Dolphin A CE version



7. Platform light (green).

8. Overload light (yellow).

9. OK light (green)

10. ASL light (red).

11. Fault light (red).

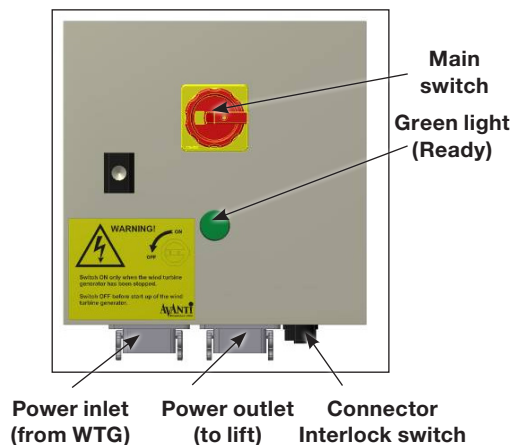


<sup>1)</sup>Note: An interlock system (trapped key or guard locking) is mandatory for the CE versions if platform fences are equipped with doors. Optional for the AECO version.

## 3.12 Bottom platform control box

The control box is installed at the bottom platform fence. The control box has a main switch. Turn the switch to the OFF position to cut the power to the service lift. The main switch must be set to OFF when the lift is not in use, when leaving the wind turbine and while the wind turbine is running. It must be set to OFF before starting an electrical generator.

### 3.12.1 For Dolphin V CE versions with guard locking

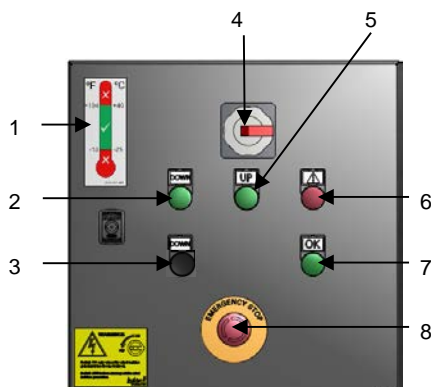


### 3.12.2 For Dolphin V CE versions with trapped key and for AECO version



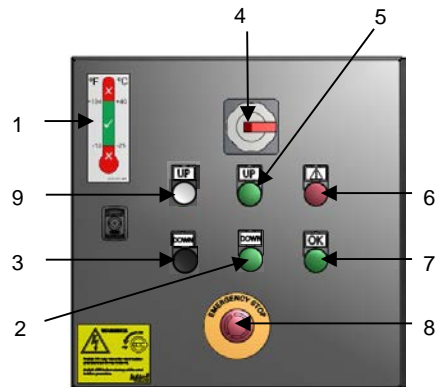
### 3.12.3 For Dolphin A CE version

#### 3.12.3.1 Call only configuration



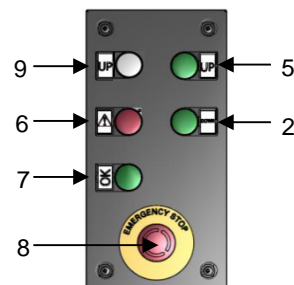
1. CCV sticker (if applicable)
2. DOWN light (green)
3. DOWN button (black)
4. Main switch
5. UP light (green)
6. Fault light (red)
7. OK light (green)
8. Emergency stop button
9. UP button (white)

#### 3.12.3.2 Send and call configuration

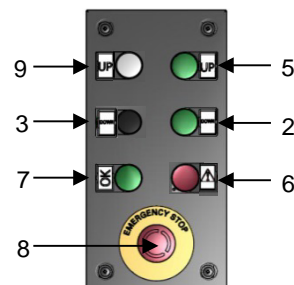


## 3.13 Intermediate and top platform control box for Dolphin A CE version

### 3.13.1 Call only configuration



### 3.13.2 Send and call configuration



## 3.14 Platform fences

The platform holes shall be protected with platform fences. The platform fences consist of structures, with or without perforated sheets, of different geometries depending on the platforms where they are installed.

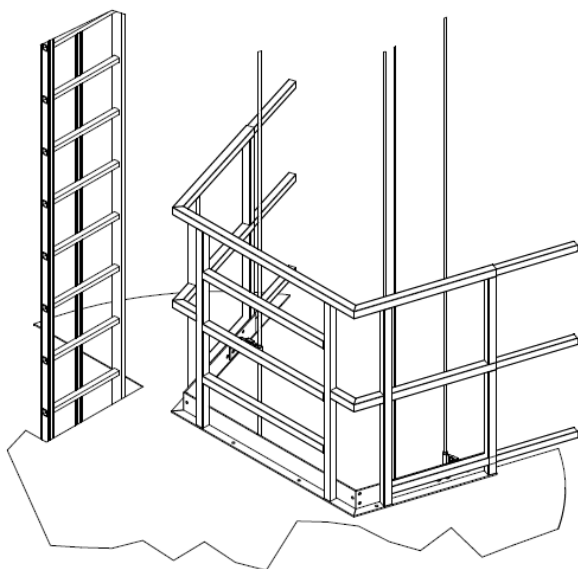
### 3.14.1 Fences for Dolphin V and A CE versions

The platform fences shall conform to EN 14122-3.

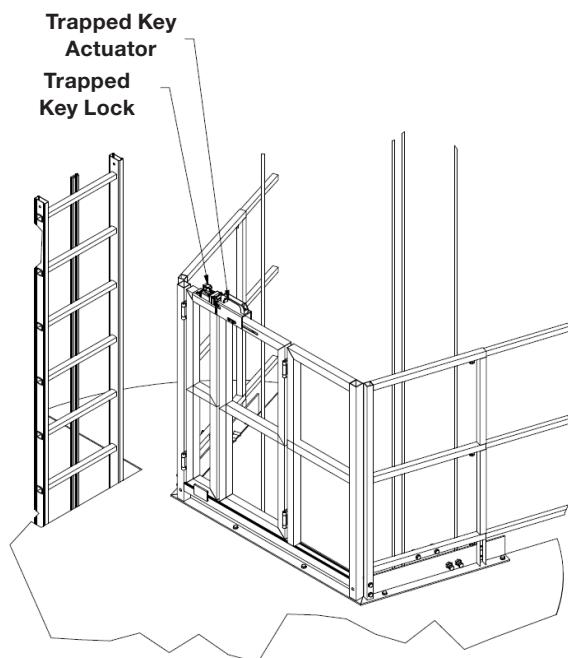
The following types of fences are possible as long as the following points are fulfilled:

1. The doors shall be monitored with an interlock system: either trapped key or guard locking.
2. The fixed fences shall only be installed in infrequently accessed platforms (access to platform maximum once per year).
3. The railing type fence is only possible if the service lift is equipped with a top obstruction device.

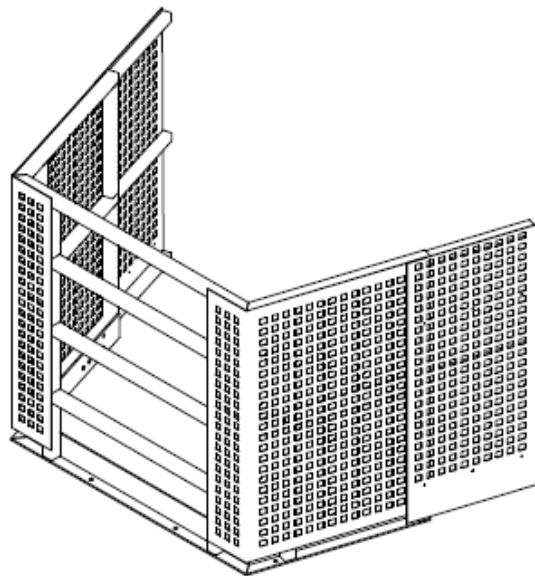
#### 1. Fixed railing.



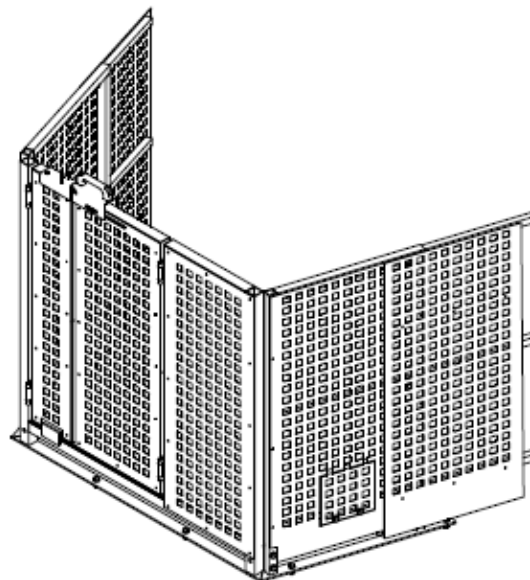
#### 2. Railing type with door.



#### 3. Fixed perforated sheets.



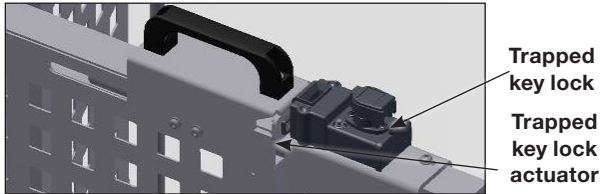
#### 4. Perforated sheets with door.



#### 5. Perforated sheet type of 2,4m high, and with door equipped with guard locking.

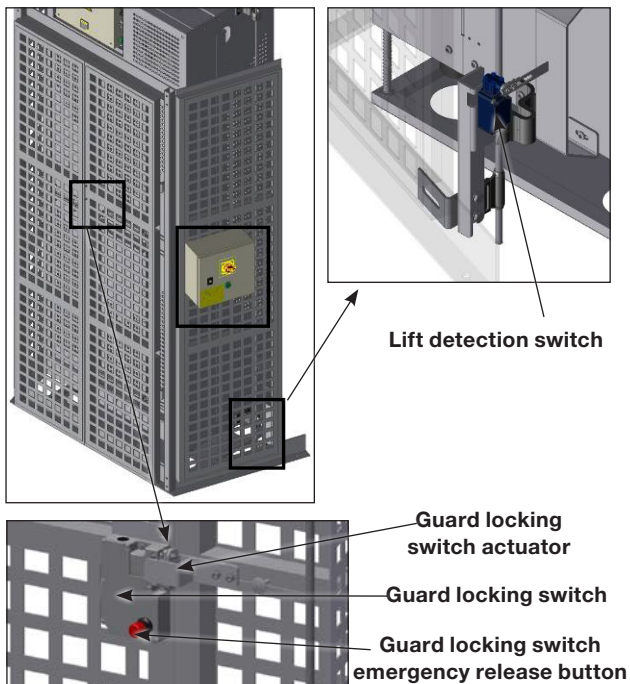
### 3.14.1.1 Trapped key system<sup>1)</sup>

The platform fence door is fitted with a trapped key lock keeping the door locked while the service lift is not at the platform. The door can be unlocked by using the trapped key on the user control box and opening the trapped key lock. The key will get trapped until the door is closed and locked again.



### 3.14.1.2 Guard locking system<sup>1)</sup>

The platform fence door is fitted with an interlock system keeping the door locked while the service lift is not at the platform. The door is unlocked when the service lift is at the platform with the lift detection switch activated. The green light is ON when the door is closed.

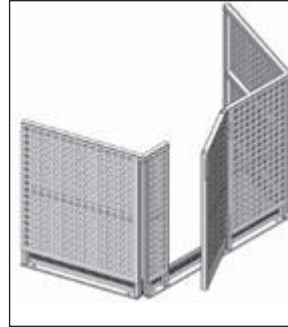


### 3.14.2 Fences for Dolphin V AECO version

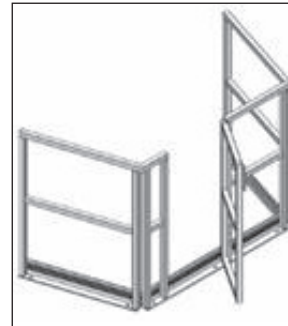


*The platform fences shall comply with ASME A17.1.5.11.*

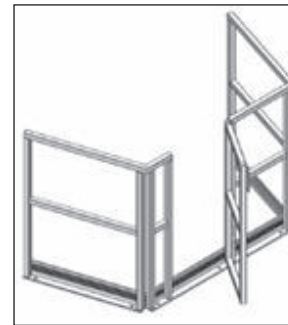
#### Fence of bottom platform



#### Fence of intermediate platform



#### Fence of top platform



<sup>1)</sup>Note: An interlock system (trapped key or guard locking) is mandatory for the CE versions if platform fences are equipped with doors. Optional for the AECO version.



### 3.15 Service lift door

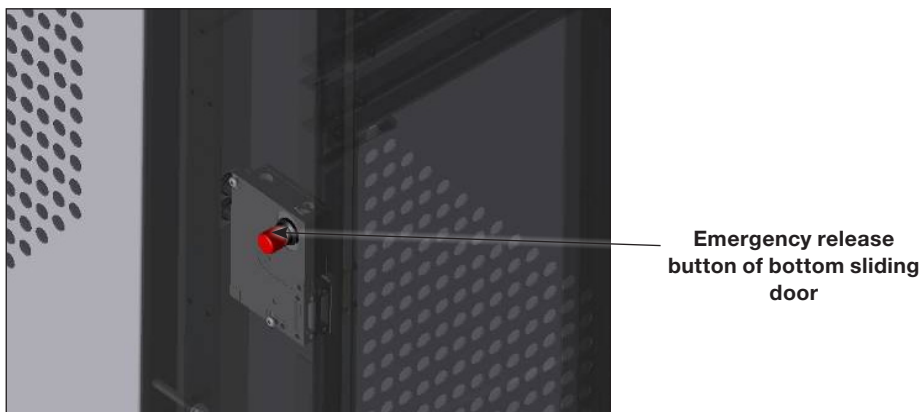
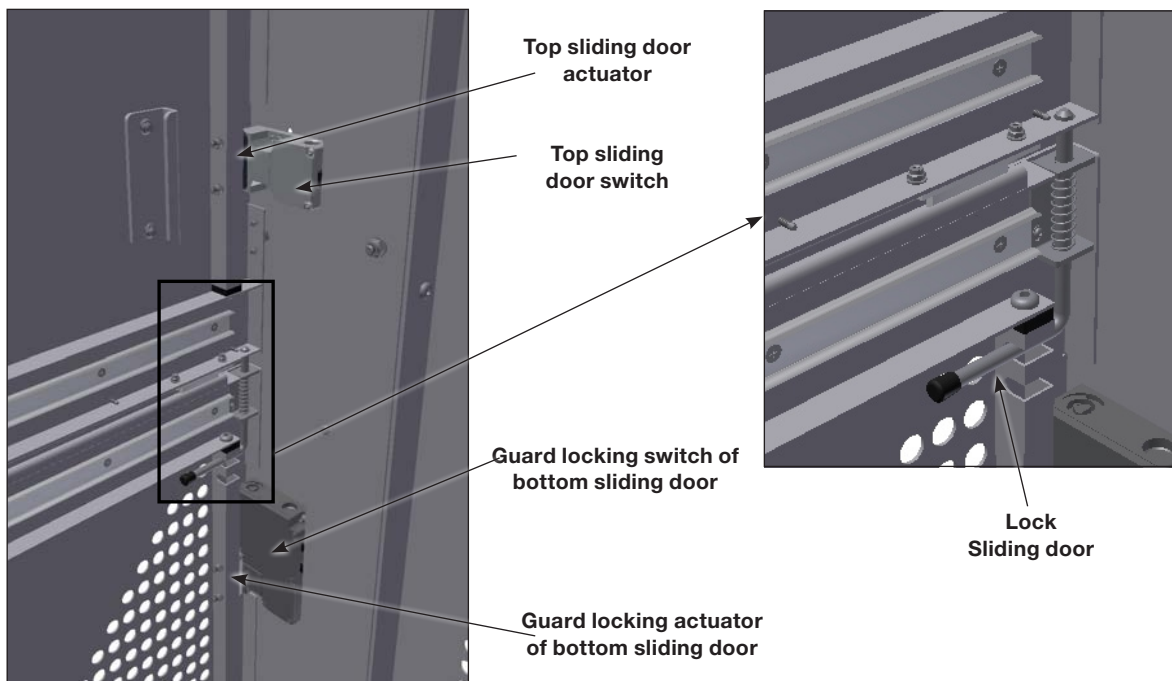
The top sliding door is closed by pushing the actuator into the door switch. The control will be interrupted if the door is not closed properly or opened while the lift is moving.

The bottom sliding door is closed by pushing the actuator into the guard locking switch. The guard locking switch is automatically unlocked when the cabin is located on the top or the bottom platform.

Optionally, the service lift can be equipped with a platform switch (S18), which allows the bottom sliding door to be opened when the service lift is levelled with a platform. This switch is triggered by the platform activation plates.

In case of power cut, need of evacuation between platforms or need to access intermediate platforms, the guard locking switch can be unlocked by pushing its emergency release red button. To reach the emergency release red button from inside the cabin the following actions are required:

- Remove the lock between the top and bottom sliding door by pushing it down
- Open the top sliding door
- Push the emergency release red button and open the bottom sliding door at the same time.



### 3.16 Emergency top limit switch

At the top of the cabin a top limit switch <sup>1)</sup> will stop ascent when activated. Descent will still be possible. A top limit device activating the top stop switch is installed below the traction wire rope fastenings. Emergency top limit switch <sup>1)</sup> interrupts the control if the top limit switch <sup>1)</sup> fails. Manual descent is possible.

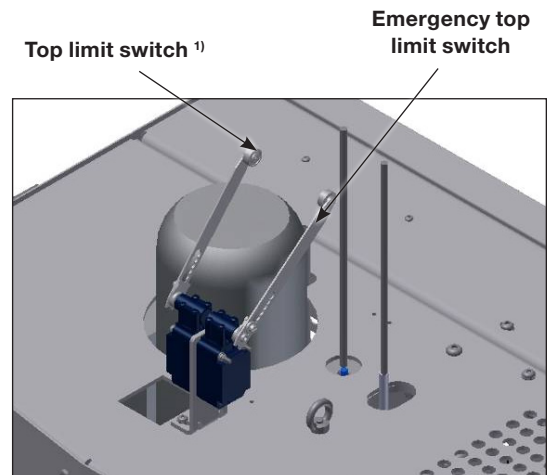


*When the top limit switch <sup>1)</sup> is engaged, press the DOWN button until the top limit switch <sup>1)</sup> is released*



*Do not use the service lift until the top limit switch <sup>1)</sup> fault has been rectified.*

<sup>1)</sup>Note: Top limit switch, or top obstruction switch if top obstruction device is supplied.



### 3.17 Top obstruction device <sup>2)</sup>

The top obstruction device switch stops ascent if the service lift:

- encounters an obstacle
- touches the top limit device

Descent will be possible, for instance to remove the obstacle.

### 3.18 Bottom obstruction device

The bottom obstruction switch stops descent if the service lift:

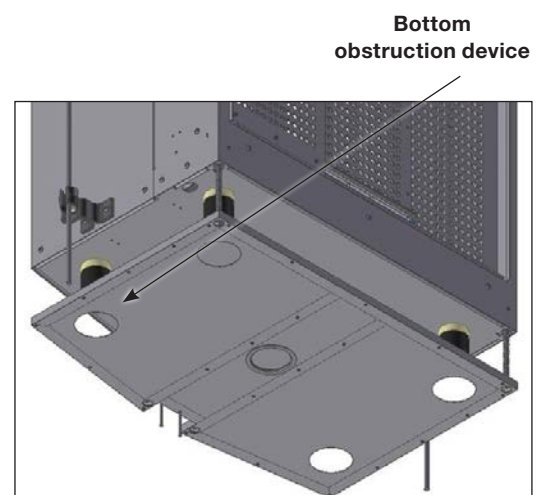
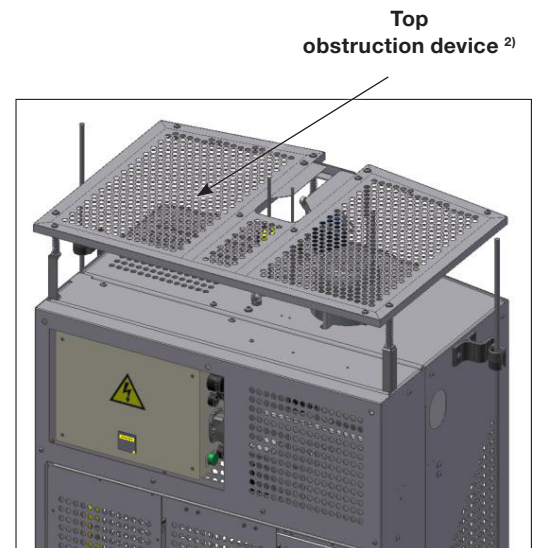
- encounters an obstacle
- touches the ground

Ascent will be possible, for instance to remove the obstacle.

In order to put the service lift on the ground, the functionality of the Bottom obstruction device can be bypassed with the bottom obstruction override switch in the user control box. To do so, turn the bottom obstruction override switch while pressing the DOWN button.



*Release the DOWN button as soon as the rubber bumpers hit the floor. Otherwise the lift or the installation may get damaged.*



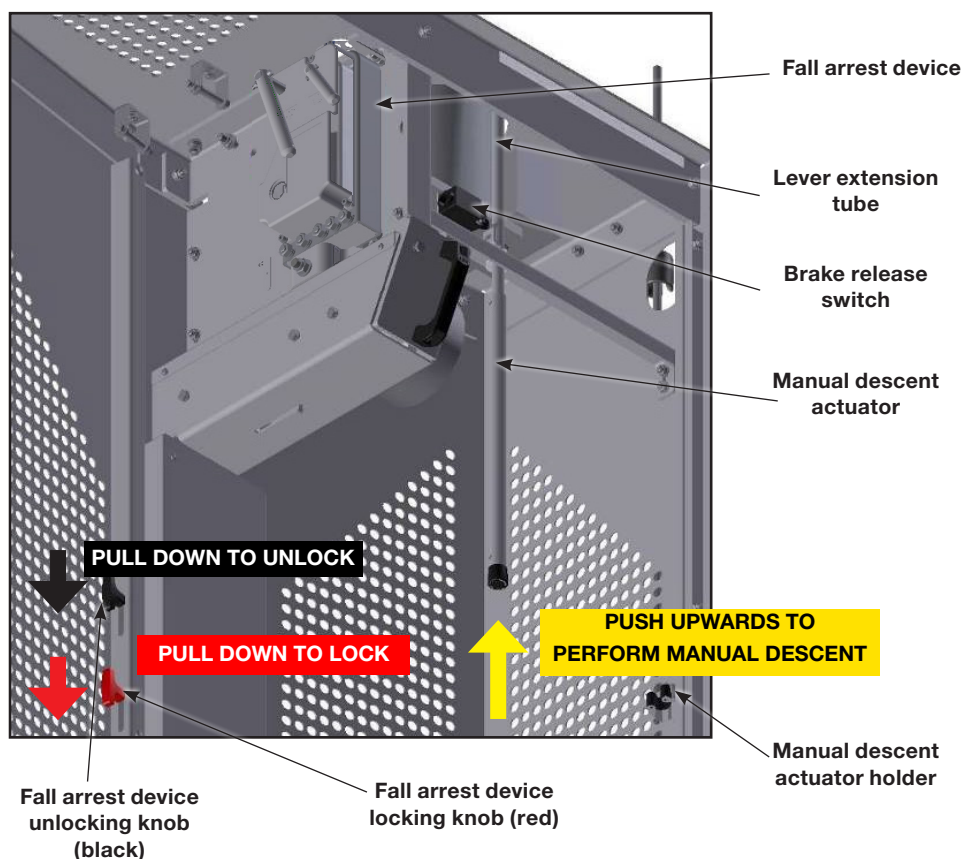
<sup>1)</sup>Note: Top limit switch, or top obstruction switch if the top obstruction device <sup>2)</sup> is supplied.

<sup>2)</sup>Note: Optional for CE versions if platform fences are not railing type. Mandatory for CE versions if platform fences are railing type. Mandatory for AECO versions.

### 3.19 Manual descent system

The service lift is provided with a lever allowing manual release of the electromagnetic motor brake. Once the motor brake is released, the service lift descends with a controlled speed limited by a centrifugal brake installed between the motor shaft and the gear box.

When the manual descent actuator is pushed upwards, the brake release switch is activated. The brake release switch will interrupt any control function. The manual descent buzzer will sound while the service lift descends.



### 3.20 Fall arrest device

The service lift is equipped with a fall arrest device which will be triggered in case of an overspeed condition. The speed of the safety wire rope passing through the device is continuously monitored, and the jaws are automatically closed in the event of sudden excessive speed.

This device protects the service lift against traction wire rope breakages or traction system failures.

The fall arrest device can also be engaged manually in an emergency by pulling downwards the red locking knob on the back of the lift, this will turn its emergency stop lever counter clockwise. To release the fall arrest device stop lever, the black unlocking knob on the back part of the lift has to be pulled downwards.



*Tightness of safety wire rope must be frequently inspected to ensure full functionality of fall arrest device!*



### 3.21 Overload limiter

A lifting force limiter is built into the wire rope traction system and will prevent upward travel in the event of overload. In case of overload, the lift's upward travel will be blocked, and a buzzer will sound in the user control box. The buzzer will stop only when the cause of the overload has been removed.

- Reduce the load to below the overload limit.
- Lower the lift until it is free of the obstacle and remove the obstacle before using the lift again



*On entering and starting the lift, the buzzer may sound briefly. This is due to temporary load peaks occurring as the lift takes off. The control box is designed not to activate the buzzer or stop the lift because of peak loads caused by the cabin swinging.*



*Attempting to run an overloaded lift is prohibited!*

### 3.22 Slack rope sensor <sup>1)</sup>

Installed on the top of the service lift, over the traction hoist, when engaged it interrupts descent. It detects slack traction wire rope.



### 3.23 Warning light <sup>1)</sup>

An optional set of warning lights can be mounted on the top and at the base of the lift. The flashes warn that the lift is moving.

### 3.24 Acoustic buzzer <sup>2)</sup>

An optional audible signal can be installed with the same warning function.

### 3.25 Anchor points

The service lift is equipped with two anchor points inside the cabin. During operation personnel shall hook themselves up to the anchor points inside the cabin. In case of need of evacuation, the evacuation procedure must be observed.

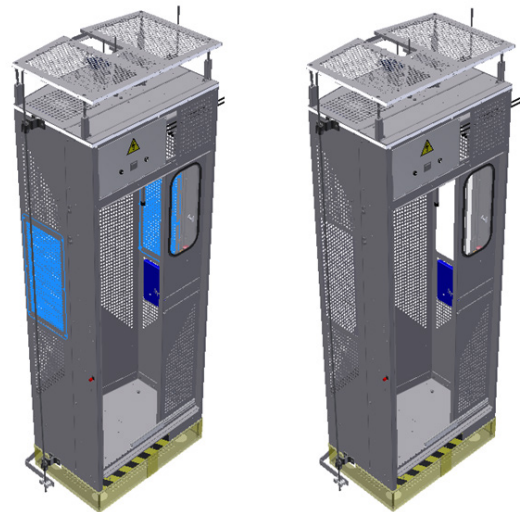
There is an optional external anchor point outside the cabin to facilitate the evacuation and rescue operations.

### 3.26 Internal light <sup>3)</sup>

The service lift is equipped with a light inside the cabin. The light is on when the lift is powered. Optionally this light can be battery packed in order to illuminate inside cabin without electric supply (once charged).

### 3.27 Lateral removable windows for Dolphin A version

The cabin has two lateral windows that are removable to facilitate maintenance tasks on the tower from inside the lift.



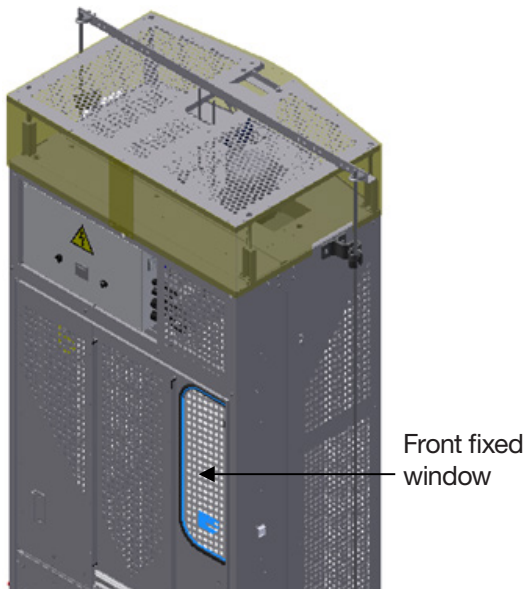
<sup>1)</sup>Note: Optional for V CE version. Not available for A CE version. Mandatory for AECO version.

<sup>2)</sup>Note: Optional for V CE version. Not available for A CE version. Optional for AECO version.

<sup>3)</sup>Note: Optional for V CE version. Mandatory for A CE version. Mandatory for AECO version.

### 3.28 Front fixed window for Dolphin A version

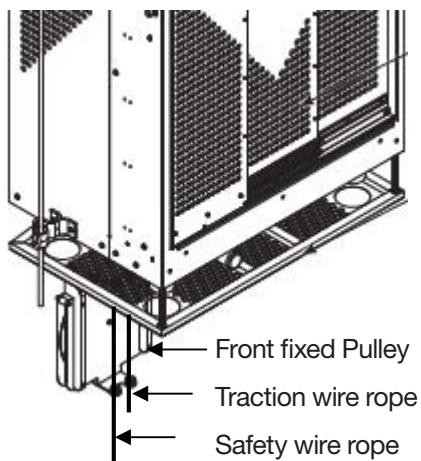
The front fixed window is transparent to enable users look outside without the need to open the door. This window cannot be removed.



### 3.29 Travelling cable pulley <sup>1)</sup>

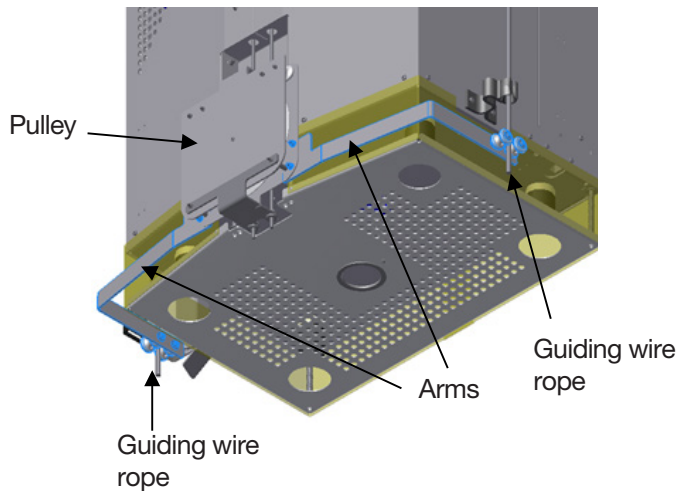
A travelling cable pulley is suspended on the power cable and is guided along the traction and safety wire ropes. The pulley straightens the power cable at all times.

#### 3.29.1 For Dolphin V CE and AECO versions



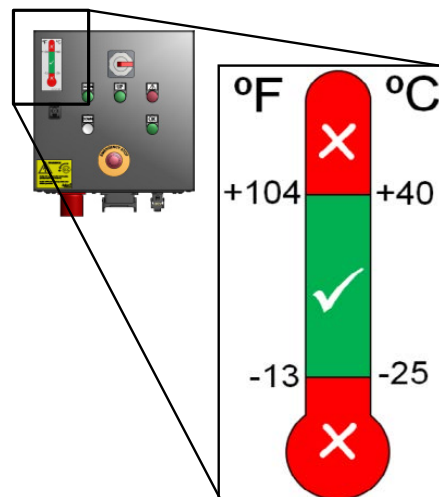
#### 3.29.2 For Dolphin A version

The travelling cable pulley has two arms attached to the guiding wire ropes. This way, the guiding of the pulley improves.



### 3.30 CCV sticker

The Cold Climate Version sticker indicates the temperature range wherein the CCV service lift may be operated.



<sup>1)</sup>Note: Optional for Dolphin V CE versions. Mandatory for Dolphin A version and for Dolphin V AECO version.

## 4. Installation

### 4.1 WTG integration requirements

WTG component	General integration requirements	
Power supply	Type	3 Phase + PE + N
	Voltage (50 Hz)	400 V/ 690 V
	Voltage (60 Hz)	400 V/ 690 V
	Fuses	16 A
	Protection	According to EN 60204-1
Platforms	Minimum clearance around service lift	60 mm
Evacuation way	Means of evacuation shall be provided with a minimum distance of	1100 mm
Platform fences	Minimum height	1100 mm
	Compliant to requirements of standard	EN 14122-3
	Fence door interlock system	Trapped key or guard locking
Hoistway	Maximum total travel height	180 m
	Maximum angle between hoistway and vertical axis	$\pm 1.5^\circ$
Top beam	Forces capable to withstand	Upon request from AVANTI

Depending on travel path, dimensions may need to be larger in order to avoid collisions of travelling cable pulley with platforms. Other dimensions are possible upon request and design verification by AVANTI.

The WTG manufacturer shall put in place any other means necessary to ensure the safe use of the service lift according to AVANTI recommendations and its own risk assessment for the integration that shall include items which are not under AVANTI's scope.

### 4.2 Cautions



Please familiarise yourself with these instructions and the User's Manual before installing the service lift. Ensure that all specified parts are present before commencing installation.

No warranty is provided against damage and injury resulting from not following this "User's, Maintenance and Installation Manual" i.e. reconstruction or modification of equipment or use of non-original parts which are not approved by the manufacturer.

Prior to installation, ensure that:

- Building sections involved will be able to withstand the service lift loads.
- All parts are available and fully functional.
- Travel zone is protected by fences at each platform.
- Walking way surfaces are dry and not slippery.

The customer must define the maximum allowable wind speed ensuring safe installation.

During installation tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment if falling height is higher than 2 m, hand gloves, helmet, safety glasses, working gear.
- Use a hand winch attachable to the ladder when elevating heavy weights.
- Use a wire rope clamp or grip when lowering wire ropes, in order to avoid the risk of personnel losing the wire rope, and wire rope getting damaged or person being hit. The clamp shall be secured to a platform anchor point. The diameter of the clamps or grips shall match the diameter of the wire ropes.
- Not work at different levels if tasks involve risk of falling objects.

### 4.3 Electrical connections



Before making any connection, disconnect any power supply to the service lift and the fence interlock system.



For CE versions: the electrical connection of the system must be made in accordance with EN 60204-1.

The power supply must be protected by a fuse and against indirect contacts according to local regulations. Verify that the rated grid and motor voltages are identical.

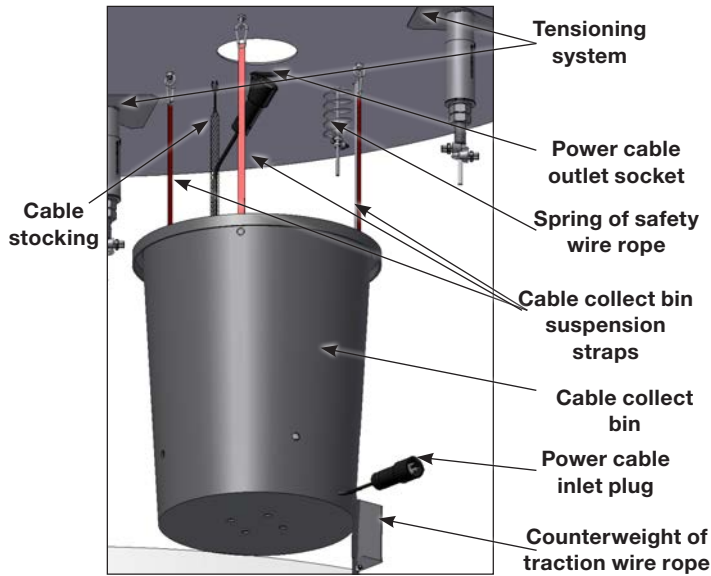


When plugging the service lift to the power supply, ensure that supply phases are correct!

#### 4.3.1 Power cable

##### 4.3.1.1 Cable bin <sup>1)</sup>

- Hang the cable collect bin underneath the power cable hole of the bottom platform using the straps supplied. Attach the straps on the holes.



- Cut the transport strips and tape holding the cable inside the bin and connect the cable stocking to the eyebolt underneath the service lift floor
- Connect the power cable outlet socket to the service lift inlet plug attaching the cable to the cabin with cable ties.

#### 4.3.1.2 Travelling cable <sup>2)</sup>

If optional travelling cable is used instead of standard cable bin:

- Install the junction box on the first platform over mid tower's height.
- Cut the transport strips which hold the cable and connect the cable inlet to the junction box
- Uncoil the cable to the bottom platform.
- Connect the power cable outlet socket to the service lift inlet plug.



#### 4.3.2 Guard locking system <sup>3)</sup>

- Install the guard locking control box on the bottom platform fence.
- Install the guard locking switch and its actuator on the fence door using the supplied hardware
- Install the lift detection switch on its bracket on the bottom fence toeboard and connect to the socket on the guard locking control box.
- Connect the power cable power inlet plug to the guard locking control box outlet.

## 4.4 Guiding, traction and safety wire ropes

### 4.4.1 Top platform

Guiding, traction and safety wire ropes are attached to the suspension beam on the available holes. To install them on the suspension beam:

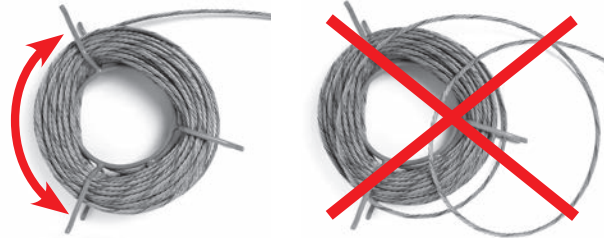
- 1) Mount the guiding wire ropes ( 12 mm) and the traction and safety wire ropes ( 8 mm) using the shackles supplied for the suspension beam at the top of the tower, with the guide wire rope outermost on either side.
- 2) Fit the nuts and bolts on the shackles. Lock with cotter pins.
- 3) Fit the top limit device <sup>1)</sup> on the traction wire rope leaving at least 200 mm between top limit device <sup>1)</sup> and shackle. Adjust the final position during first run so that the service lift is levelled with the top platform when it stops.
- 4) Uncoil all wire ropes to the bottom of the tower



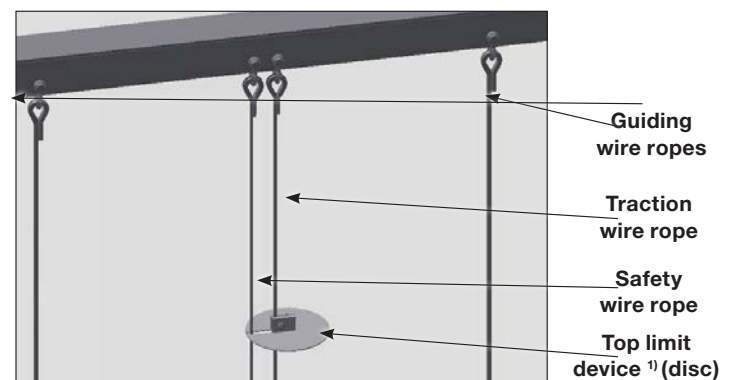
*All wire ropes must be evenly uncoiled to prevent looping.*



*Do not pull wire rope over edges.*



#### 4.4.1.1 Top limit device <sup>1)</sup> (disc)



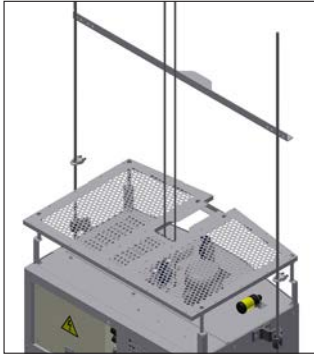
<sup>1)</sup>Note: Optional for Dolphin V CE versions. Not available for Dolphin A version and for AECO version.

<sup>2)</sup>Note: Optional for Dolphin V CE versions. Mandatory for Dolphin A version and for AECO version.

<sup>3)</sup>Note: An interlock system (trapped key or guard locking) is mandatory for CE versions if platform fences are equipped with doors. Optional for AECO version.



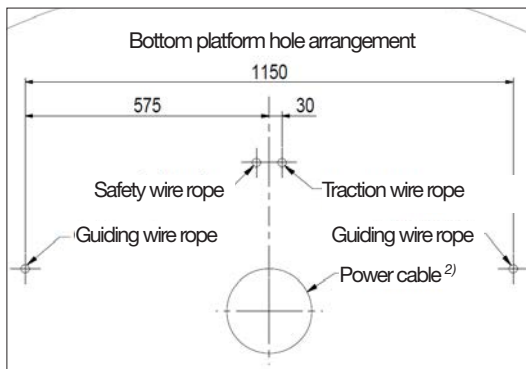
#### 4.4.1.2 Top limit device <sup>1)</sup> (bar)



### 4.4.2 Bottom platform

#### 4.4.2.1 Guiding wire ropes:

- 1) Feed the guiding wire ropes through the wire-guides on the service lift and the holes in the platform
- 2) Fit the correct number of wire rope fixes on the wire rope and feed through the wire rope guides. The wire rope fixes are fitted during the first run
- 3) Pull the guiding wire rope through the platform and fasten it with the tensioning system
- 4) Pre-tighten the wire ropes using the tensioning system
- 5) Final tightening must be performed after the first run
  - a. Feed the wire ropes through the tensioning system
  - b. Attach the wire rope to the tensioning system using the wire rope grips and make a mark on the wire rope before starting tensioning.
  - c. After the first run tightens, tension the wire ropes to 4000 N (the wire rope stretches approximately 50 N/mm) using the supplied nut. Use the second nut to lock the assembly.

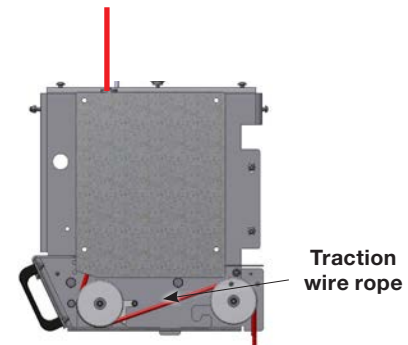


<sup>1)</sup>Note: Top limit device (disc) is mandatory for CE versions if top obstruction device is not present. Top limit device (bar) is mandatory for CE versions if top obstruction device is present. Top limit device (bar) is mandatory for AECO version.

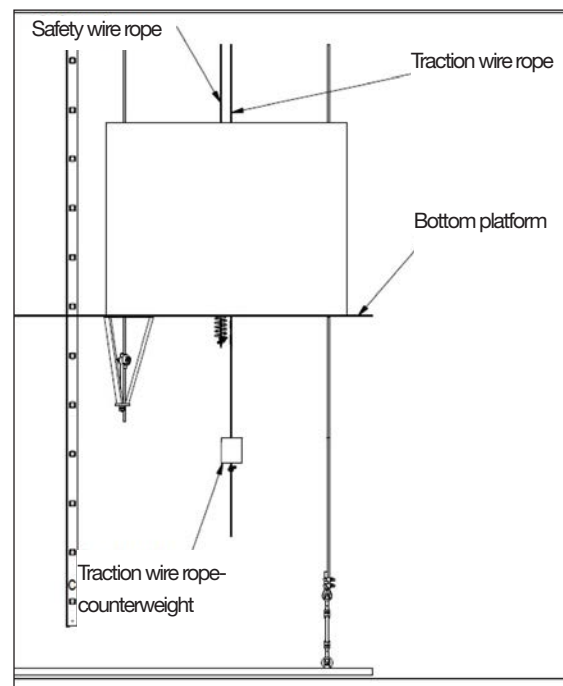
<sup>2)</sup>Note: Power cable hole is only necessary when cable bin is installed.

#### 4.4.2.2 Traction wire rope

- 1) Open the maintenance cover on the back of the service lift.
- 2) Remove protection guard above rollers.
- 3) Feed the wire rope between the two bushings of the slack rope sensor <sup>1)</sup>.
- 4) Feed the wire rope through the roof into the traction hoist's wire rope inlet opening.
- 5) Push the UP button of the cabin control box and feed wire rope through until the traction hoist starts pulling. Ensure that the wire rope can exit without obstruction!
- 6) Continue feeding the wire rope around the pulleys to the back of the lift.



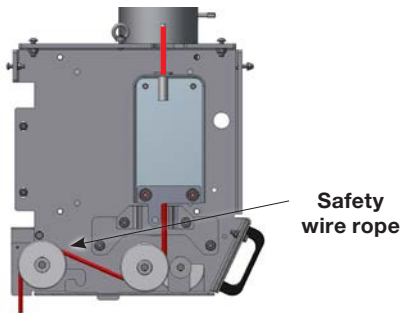
- 7) Feed the wire through the guide bushings (including pulley ones when using travelling cable).
- 8) Feed the wire rope through the platform holes.
- 9) Secure the 11 kg counterweight on the traction wire rope at least 600 mm below the bottom platform (See figure below). The remaining wire rope must be coiled and fastened with at least 3 strips. The counterweight and the excess of wire rope shall be able to rotate freely.



<sup>1)</sup>Note: Optional for CE versions. Mandatory for AECO version.

#### 4.4.2.3 Safety wire rope

- 1) Open the maintenance cover on the back of the service lift.
- 2) Remove protection guard above rollers.
- 3) Feed the wire rope through the roof into the fall arrest device's wire inlet opening.
- 4) Pull the wire rope through the fall arrest device while turning the release lever clockwise.
- 5) Continue feeding the wire rope around the pulleys to the back of the lift.



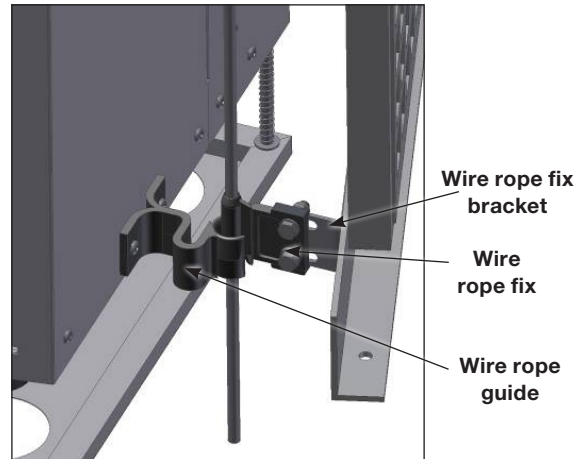
- 6) Feed the wire rope through the guide bushings of the cabin.
- 7) Feed the wire rope through the guide bushings of the travelling cable pulley.
- 8) Feed the wire rope through the platform holes.
- 9) Feed the compression spring through the safety wire rope.
- 10) Pre-tension the safety wire by hand as much as possible before fastening the wire locks.
- 11) Cut the mounting strips that keep the spring compressed. This will apply a tension of approximately 40 kg to the safety wire rope.

#### 4.4.2.4 Travelling cable <sup>2)</sup> adjustment

1. Guide the travelling cable through the travelling cable <sup>2)</sup> pulley.
2. Connect the outlet socket of the travelling cable to the inlet plug of the service lift using a cable stocking. Attach the shackle to the eyebolt on the back of the service lift.
3. Attach the travelling cable <sup>2)</sup> to the cabin by means of cable ties.

#### 4.5 Wire rope fix

Wire rope fixes are installed and adjusted during the first run so that the centres of the wire rope fixes are in the centre of the service lift wireguides. Wire rope fixes must be installed on each platform and as required along the tower (MAX. 30 m) to improve guiding to avoid collision with tower elements. Use the oblong holes on the wirefix brackets to align and adjust the wire rope fix position.



#### 4.6 Danger zone sticker

Mount the "Danger Zone" sticker in the front door of the bottom platform fence. Make sure that the fence is clean and dry before attaching the sticker.

#### 4.7 Inspection before first use



*AVANTI or qualified personnel authorised by AVANTI must carry out an inspection before first use following the "Appendix C: Inspection checklist".*



*The inspection before first use must be recorded for future reference (filling in the "Appendix C: Inspection log sheet").*

## 5. Instructions for use

### 5.1 Prohibited uses



*The consequences of not following below prohibitions are extremely hazardous to the physical integrity of the users.*

When using the service lift it is prohibited to:

- Use the service lift beyond its intended purpose.
- Operate the service lift without following the safety warnings and operating instructions.
- Overload the service lift
- Try to repair machine components. Only personnel from AVANTI or qualified personnel authorised by AVANTI are allowed to perform service on the machine.
- To use the ladder, unless service lift is out of service, or in case of evacuation or rescue.
- To manipulate switches and safeties.
- To place objects on service lift roof.
- To descend on service lift roof.



### 5.2 Operation from inside the cabin (manual)

1. Turn the main switch of the platform control box to the ON position
2. Enter the service lift and close the bottom / top fence door
3. Turn the trapped key switch ON
4. To go up or down, push and hold the UP or DOWN button as needed



*In the event of traction wire rope breaks or traction hoist fails, evacuate the service lift.*

### 5.3 Operation from outside the cabin (automatic send)



*Transportation of people is forbidden if the operation is controlled from outside the service lift.*



*Automatic function is only possible from top platform to bottom platform and vice versa.*

#### 5.3.1 Bottom platform

1. Turn the main switch ON of the platform control box.
2. Insert the trapped key inside the switch on the user control box and turn it ON
3. Close the service lift door

4. Close the bottom platform fence door
5. Press the UP button using the send tool

#### 5.3.2 Top platform

1. Close the top fence door.
2. Insert the trapped key in the switch of the user control box and turn it ON
3. Close the service lift door
4. Press the DOWN button

### 5.4 Operation from the platform control boxes

1. Turn the trapped key switch to ON.
2. Close the door of the cabin and of the platform fence.
3. Press and hold the UP or DOWN button to ascend or descend the cabin.



*When the UP or DOWN button of a platform control box is pressed and held, the response of the cabin is delayed 5 seconds. During this delay, an acoustic signal will sound. This way, any personnel in the surroundings are warned of the imminent movement of the service lift.*



*Transportation of people is forbidden if the operation is controlled from a platform control box.*

### 5.5 Fall arrest device

If the fall arrest device engages simply disengage it by pulling downwards the black knob on the back of the lift until the fall arrest device is unlocked. However, this is not possible if the safety wire rope is under tension. If this is the case:

1. Remove the load on the safety wire rope by pushing the UP button ascending the service lift a few centimetres.
2. Manually open the fall arrest device by pulling downwards the black knob until the fall arrest device is unlocked.

In case of power failure and the fall arrest device is locked with the safety wire rope under tension evacuate the lift according to the evacuation procedure.



*The safety wire rope and the attachment between the fall arrest device and the service lift are exposed to dynamic loads when a fall is prevented. When the service lift has returned to the bottom platform, test the fall arrest device functionality. Replace any defective fall arrest device components and return them for repair to AVANTI.*



## 5.6 Manual descent

In case of power failure, a manual descent without power can be performed. To do so:

1. Verify that the fall arrest device is unlocked
2. Check that there are no obstacles or persons in the travel zone.
3. Take the manual descent actuator from its holder and insert it on the lever extension tube.
4. Push the manual descent actuator upwards. The service lift will start descent and a buzzer will sound.
5. To stop the manual descent, stop pushing upwards.



*During the manual descent, the door and hatches of the lift shall be kept closed.*



*Always look through the perforated floor of the cabin to see if anyone is standing on the ladder.*



*Use the walkie-talkie to report about the manual descent.*



*During the manual descent, stop the service lift just before reaching the bottom platform floor.*



*This way, the bottom obstruction device will not get damaged.*



*The manual descents shall be of maximum 30 m. Between two consecutive manual descents, the user shall wait minimum 10 minutes for the centrifugal brake to cool down. This way, the premature wear of the centrifugal brake will be prevented.*

## 5.7 Lateral removable windows for Dolphin A version

To open the windows:

1. Press the emergency stop button of the cabin control box.
2. Remove the lateral windows from the cabin lateral panels by unscrewing its riveted screws with a Torx screwdriver.

To close the windows:

1. Install the lateral windows by screwing its riveted screws back on the cabin lateral panels with a Torx screwdriver.
2. Press and turn the emergency stop button of the cabin control box.





*The lateral removable windows shall only be used by AVANTI or qualified personnel authorised by AVANTI.*


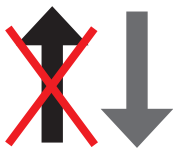



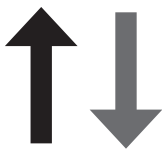





*The lateral removable windows shall only be used for maintenance tasks.*

## 5.8 Troubleshooting

1. All tests and repairs to the electronic components should be performed by **authorised personnel only!** The wiring diagram is placed in the power cabinet.
2. Repairs to the traction hoist, the fall arrest device and to the system's supporting components should be performed by **qualified personnel only!**

Breakdown	Cause	Solution
<p>The service lift will <b>neither go up nor down!</b></p>  <p> <b>DANGER!</b> Attempting to use the lift will jeopardize work safety</p>	<b>A1 The fixed EMERGENCY STOP button has been activated.</b>	Reset the button in question by pulling or turning it
	<b>A2 Wire rope loop</b> on traction hoist. Damaged or defective wire rope or wire rope outlet causes problems.	<b>Stop work immediately!</b> Ask the supplier or manufacturer for help.
	<b>A3 The fall arrest device is holding the service lift on the safety wire.</b> a) Lift wire rope breakage b) Hoist failure	a) + b) Evacuate the service lift
	<b>A4 The service lift is stuck on an obstacle.</b>	Carefully remove the obstacle. Test the operational safety of affected tower sections. Inform the supervisor.
	<b>A5 Power failure</b> a) Main switch is OFF b) Grid voltage interrupted c) Supply between grid connection and control interrupted	a) Turn the main switch ON b) Find the cause and wait for the power to return. c) Test and if necessary repair the supply cable, fuses, and/or wiring from the control box.
	<b>A6 A safety switch is triggered:</b> a) Emergency top limit switch is activated. b) Top and/or bottom sliding door is open. c) Manual descent switch is activated	a) Perform manual descent until the limit stop switch is released. b) Close the top and/or bottom sliding door. c) Adjust manual descent switch so that it is not involuntarily activated.
	<b>A7 Protection switch on overheating</b> a) A phase is missing b) Motor is not cooling c) Voltage too high/low	a) Test/repair fuses, supply and connection. b) Clean the motor cover. c) Measure voltage and power consumption on the loaded motor. If voltage deviates from specifications, use cable with increased dimensions.
	<b>A8 Brake does not open (no click on on/off)</b> a) Supply, braking coil or rectifier defective. b) Braking rotor closes.	a) Have an authorized person, repair/replace the supply, braking coil and rectifier. b) Return traction hoist for repair.
	<b>A9 If trapped key system is provided:</b> the trapped key is not present or the trapped key switch is in the OFF position.	Insert the key and turn it to the ON position
	<b>A10 If guard locking system of fences is provided:</b> the guard locking switch and/or interlock control box is defective.	Test / Repair defective components.

Breakdown	Cause	Solution
	<b>A11 The service lift is stuck on an obstacle below it.</b>	a) Evacuate the service lift b) Inform the supervisor c) Check the Bottom obstruction device connection/function. Replace if necessary.
	<b>A12 Service lift is overloaded</b> (buzzer sounds).  <i>Not applicable to CE versions. Only applicable to AECO version.</i>	Test and/or reduce load until buzzer stops.
Service lift goes down but not up 	<b>B1 The service lift is stuck on an obstacle.</b>	Carefully move the service lift downwards and remove the obstacle. Test the operational safety of affected platform components. Inform the supervisor.
	<b>B2 Service lift is overloaded</b> (buzzer sounds).  <i>Only applicable to CE versions. Not applicable to AECO version.</i>	Test and possibly reduce load until buzzer stops.
	<b>B3 Top limit switch <sup>1)</sup>:</b> a) Top limit switch <sup>1)</sup> is defective or not connected. b) Top limit switch <sup>1)</sup> is activated.  <i><sup>1)</sup>Note: Top limit switch, or top obstruction switch if top obstruction device is supplied.</i>	a) Test the top limit switch <sup>1)</sup> connection/function. Replace it if necessary. b) Descend the service lift until the top limit switch <sup>1)</sup> is released.
	<b>B4 A phase is missing</b>	Test fuses and power supply.
	<b>B5 Fault in UP control circuit</b>	Test and possibly repair connections, wiring and relays.
Service lift can ascend but cannot descend. 	<b>C1 Slack rope sensor<sup>1)</sup> is engaged</b>  <i><sup>1)</sup>Note: Optional for CE version. Mandatory for AECO version.</i>	Check the reason why it is engaged, possibly it's an obstacle under the service lift or the bottom obstruction device is not functioning properly.
Motor hums loudly or wire ropes squeak, but the lift can go both up and down. 	<b>D1 Wire ropes are dirty.</b>  <i>Further use of lift may result in damage to the traction wire rope.</i>	If possible, immediately replace the traction hoist and return it for test/repair at AVANTI.

Breakdown	Cause	Solution
<p>Service lift will <b>go up but not down!</b></p> 	<p><b>D2 The service lift has encountered or is stuck on an obstacle.</b></p>	<p>Carefully take the service lift up and remove the obstacle. Test the operational safety of affected platform components. Inform the supervisor.</p>
	<p><b>D3 The fall arrest device is holding the service lift on the wire rope.</b></p> <p>a) Excessive hoist speed b) Too low release speed on fall arrest device.</p>	<p>a) + b) Take the service lift upwards to relieve the safety wire rope.</p> <p>Open the fall arrest device by pressing the handle, and test its function. Functional test when the lift is back on the ground: Replace the hoist and fall arrest device and return them for testing.</p> <p> <b>DANGER!</b> <i>A defective fall arrest device will threaten the safety of the service lift! Replace immediately!</i></p>
	<p><b>D4 Fault in down controller circuit</b></p>	<p>Insert brake lever into the traction hoist and lower lift manually. Test, and if necessary have connections, wiring, and relays repaired.</p>
	<p><b>D5 The slack rope sensor is holding the service lift on the traction wire rope.</b></p>	<p>a) The slack rope sensor has engaged: move the service lift upwards to disengage the device. b) The sensor is not properly installed: have a competent technician adjust the device correctly. c) The sensor is defective: replace it and return it for test/repair at AVANTI.</p>
	<p><b>D5 Bottom stop switch:</b> <b>a) Bottom stop switch is defective or not connected.</b> <b>b) Bottom stop switch is activated.</b></p>	<p>a) Test the bottom stop switch connection/ function. Replace if necessary. b) Descend service lift until bottom stop switch is released.</p>
<p>Button lamp not lit although operation is normal</p>	<p><b>E The lamp is defective</b></p>	<p>Have an authorised person replace it.</p>
<p>Service lift descends when UP button is pressed and ascends when DOWN button is pressed.</p>	<p><b>F If a phase control relay is not provided: two phases changed in the supply</b></p>	<p>Have an authorised person switch the 2 phases in the plug.</p>



*If these steps do not identify the cause and rectify the fault:  
Consult a qualified authorised person or contact the manufacturer.*

## 5.9 Out of service

### 1. Securing the service lift:

Bring the service lift all the way down, until the bottom stop switch stops the cabin.

### 2. Turn off the main switch to prevent inadvertent operation of the lift:

Turn the main switch to the OFF position – power supply is now interrupted. Mark the lift “OUT OF SERVICE” and padlock as necessary. Contact the service technician for repair.

## 6. Maintenance

### 6.1 Planning

Time (Performance)	Component
Daily (User)	Operating area and service lift visual inspection Service lift controls and safety devices
Annually (Expert)	Wire ropes Electrical cable
Annually (Expert)	Entire system
Annually, at least every 250 hours of operation (Expert)	Traction hoist
Annually (Expert)	Fall arrest device

### 6.2 Cautions

Before any maintenance task, ensure that walking way surfaces are dry and not slippery.

During maintenance tasks, personnel shall:

- Wear at least the following PPE: fall arrest equipment (when falling height is more than 2 m), hand gloves, helmet, safety glasses and working gear.
- Place cabin at bottom platform and disconnect power supply.
- Use an electricity measuring tool when performing inspection of electrical components.
- Use a hand winch attachable to the ladder when handling big/ heavy loads and shall be performed at least by 2 persons.
- Panel parts shall be removed to facilitate access to confined spaces.
- Use a cable grip when replacing travelling cable.
- Keep cabin doors closed when using a 3-step ladder.



*When plugging the service lift to the power supply, ensure that supply phases are correct!*

### 6.3 Daily inspection

#### Travel zone:

Ensure that there are no obstacles in the travel zone which may obstruct the travel of the service lift.

#### Service lift:

1. Check that the service lift components are mounted in accordance with the specifications and without any noticeable defects or missing components
2. Check that the traction and safety wire ropes are not damaged or jammed
3. Check that the safety devices are in place and working:
  - 3.1 Main switch: Turn the main switch on the interlock control box to the OFF position. The green light must be OFF. The service lift must not run. Turn it ON, the light shall be ON.
  - 3.2 Green light (Ready) – Service lift: Close and lock the bottom platform gallery door and the service lift door. Turn the trapped key to the ON position. The green light must be ON. It should not be possible to remove the trapped key unless it is switched OFF again.
  - 3.3 Emergency stop button: Press the emergency stop button on the cabin control box. The service lift should not move UP / DOWN. Release the emergency stop and drive the lift UP approximately 1 meter.

3.4 Service lift door: Pull the door to open. The door should not open. Unlock the top sliding door from the bottom sliding door and pull to open. The top sliding door should open, the green light must be OFF and the lift must not move UP / DOWN. Close the top sliding door and apply the lock to the bottom sliding door

3.5 Activate the fall arrest device by pulling down the red locking knob. Press and hold the DOWN button of the cabin control box. The service lift should not descend. Try to perform manual descent. The service should not descend. Press and hold the UP button of the cabin control box. The service lift should ascend. Unlock the fall arrest device by pulling down the black unlocking knob.

3.6 Perform a manual descent test for a meter. The lift should descend and the buzzer should sound.

3.7 Drive the service lift down until the Bottom obstruction device hits the bottom platform. The service lift should stop before the rubber bumpers hit the bottom platform. The service lift door and the fence door should be unlocked.

3.8 Top obstruction device <sup>1)</sup>: activate top stop by pressing it down. The service lift should not ascend until top obstruction device is released.

3.9 Slack rope sensor<sup>1)</sup>: Activate the slack rope sensor by manually pulling the traction wire rope upwards. Descent should not be possible.

4. When the lift is at the top platform, check the wire rope fastenings.

5. Record the hour meter reading in the "Appendix D: Inspection log sheet".



*If any faults occur during work,*

- stop working,
- if required secure the workplace and
- rectify the fault!



*Make sure that nobody is exposed to danger below the service lift, for instance from falling parts.*

#### **Cabin control from outside of the cabin- Automatic:**

The automatic mode function is only available from the control buttons outside of the cabin at the bottom platform and top platform. It shall be checked as follows:

1. Press the UP button on the control box. The lift should ascend.
2. Press the emergency stop button on the control box. The lift stops.
3. Pull the emergency stop button and press the DOWN button. The service lift should descend until the bottom obstruction device engages.

## **6.4 Annual inspection**

Have the entire system tested by an AVANTI trained expert at least once a year, especially the traction hoist and the fall arrest device. However, it may be required more frequently depending on use and the conditions of use and operation. The traction hoist and fall arrest device must be overhauled at AVANTI workshops and furnished with new certificate for every 250 hours of operation. Hour counter is found in the main control box.



*If fall arrest device has engaged, an expert must verify the safety of the fall arrest device, the wire rope, and wire rope fastenings.*



*The tower owner must ensure that the results of all annual and extraordinary inspections are logged in the "Appendix D: Inspection log sheet".*

### **6.4.1 Cabin**

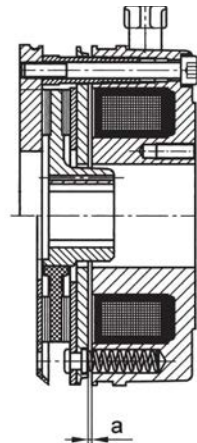
Inspect the cabin structure, joints, attachments and accessories.

### **6.4.2 Traction hoist**

The traction hoist is largely maintenance free. Clean only when very dirty. During cleaning always ensure sufficient air supply.

Annual test (only by authorized persons):

- a) Ensure that no visual defects have appeared.
- b) Check that air gap "a" between brake and disc is 0.3 mm using a thickness gauge.



- c) Test manual descent function.
- d) Test speed and current should match the service lift data plate.
- e) Check that sound and behaviour are normal.



<sup>1)</sup>Note: Optional for CE versions.  
Mandatory for AECO version.



### 6.4.3 Fall arrest device

The fall arrest device is largely maintenance free. Clean only when very dirty. Keep free from dirt and lubricate often. Using too much oil will not harm the equipment or the gripping function.

Annual test (only by authorized persons):

- a) Test the fall arrest device stop lever by pulling down the red locking knob.
- b) Test the fall arrest device stop lever reset, by pulling down the black unlocking knob.
- c) Release safety wire rope bottom attachment in the tower and pull the safety wire rope with a jerk. The overspeed device should trigger the fall arrest device automatically.
- d) Ensure that no visual defects have appeared

### 6.4.4 Traction, safety and guiding wire ropes

Carry out the following inspections and adjust if necessary:

1. Inspect all the wire ropes along their entire length.
2. Pay special attention to the wire rope ends, parts of the wire ropes running over sheaves and wire ropes under frictional wear by external components.
3. When inspecting the wire ropes, consider the following points:  
type and number of wire breaks,  
position and time sequence of wire breaks,  
decrease of the wire rope diameter during operation,  
corrosion, abrasion, deformation,  
influence of heat, and  
operating time.
4. Check that the traction and safety wire ropes are fed correctly around the 2 wire rope guide wheels.
5. Check that the wire rope ends are coiled separately under the bottom platform and tied with at least 3 cable ties.
6. Check that the guiding wire rope tensioning system is correctly installed and that the wire rope locks and fixes are properly fastened.
7. Check that the compression spring on the safety wire rope is correctly installed and that the wire rope locks are properly fastened
8. Check that the counterweight on the traction wire rope is properly fastened. The traction wire rope coil and counterweight shall be able to rotate freely. Do not attach them to a fixed part.
9. Check that the guiding wire ropes are correctly tensioned.



*Record any visible change of the condition of the wire ropes on the "Appendix C: Inspection log sheet", and monitor closely throughout time.*

### 6.4.4.1 Lubrication of the traction and safety wire ropes

1. Position the lift at the bottom platform.
2. Open the maintenance cover by unscrewing its screws.
3. Apply lubricant on the traction and safety wire ropes by means of a spray can.
4. While applying the lubricant, use the second hand to place and hold a cloth around both wire ropes. This way, the lubricant will be distributed uniformly on both wire ropes.
5. While the first user uses the spray can and the cloth, a second user presses and holds the UP button from inside the lift. This way, while the service lift ascends, the lubricant is applied along the complete length of the two wire ropes.
6. After applying the lubricant, leave the maintenance cover open and carry out a descent back to the bottom platform.
7. While descending, check that the two wire ropes have been properly and uniformly lubricated.



8. Once the service lift is at the bottom platform, clean off any lubricant accidentally applied on the cabin panels.

9. Finally, close the maintenance cover by screwing back its screws.

Only use specialised wire rope lubricants. Do not use lubricants based on lithium soap grease or bitumen. Do not use disulphide-containing lubricants like Molycote ®.

Apply lubricant using a spray can, brush, drip applicator or pressurized device.

Pay special attention to sections of the wire rope where dehydration or denaturation of the lubricant can be seen.

Re-lubricate the wire ropes before they show signs of corrosion or run dry, and taking in mind that:

A poor lubrication leads to corrosion and to a quick wear of components.

An excessive lubrication leads to dirt agglomeration on the wire rope surface. As a result, this can lead to quick wear of wire rope, sheaves and drum.

A correct lubrication keeps the efficiency factor of the wire rope, protects against corrosion, helps to elongate their lifetime significantly and ensures a safe operation.

#### 6.4.4.2 Measuring of the wire rope diameter



*When measuring the diameter of the wire ropes, use a digital calliper with broad measuring faces.*



In general, measure the diameter of the wire rope at each WTG tower platform, and under the service lift, where the wire rope is less loaded. Specifically, if a wire rope wear is detected, measure on the affected area.



*Rotate the calliper around the wire rope to measure the minimum and maximum wire rope diameter at each measurement point.*

#### 6.4.4.3 Discard criteria



*The discard criteria of the wire ropes shall be according to ISO 4309: Cranes - Wire ropes - Care and Maintenance, inspection and discard.*



*Determine and eliminate the cause before installing a new wire rope.*



*AVANTI recommends to replace the traction and safety wire ropes after 250 hours of operation (approximately every 5 years) corresponding with the refurbishment of the traction hoist and fall arrest device. Please check with your local authority regulations if it's mandatory in your case.*

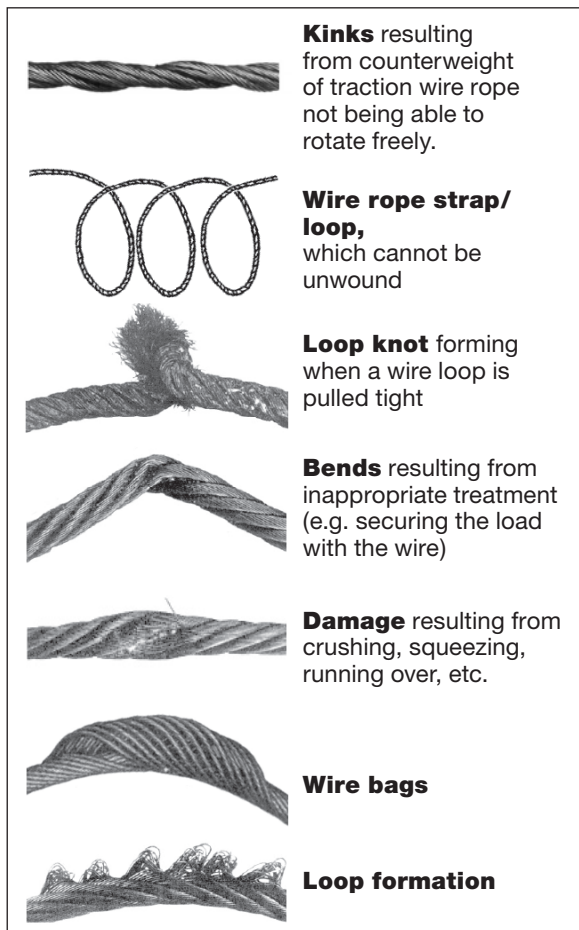
Check and replace the respective wire rope(s) if one of the following defects is found:

- For traction and safety wire ropes, if there are more than one 8-wire strand break on a wire rope length of 250 mm.



- For guiding wire ropes, if there are more than one 8-wire strand break on a wire rope length of 360 mm.
- If there is severe corrosion on the surface or the inside.
- If there is heat damage, evident by the wire rope colour.
- For traction and safety wire ropes, if the wire rope diameter is less than 8 mm.

- For guiding wire ropes, if the wire rope diameter is less than 11,4 mm.
- If there is damage on the wire rope surface (see following figures for most common examples of wire rope damage).



On AECO service lifts, according to A17.1 5.11, traction and safety wire ropes must be replaced after 250 hours of operation or 5 years whichever occurs first, corresponding with the refurbishment of the traction system.

#### 6.4.5 Repairs

Repairs to traction hoist equipment must ONLY be performed by AVANTI, and only using original spare parts.

If the gearbox oil needs to be replaced, use one of the lubricants specified below, corresponding to the temperature range in which the traction hoist equipment is used.

- Amount required: 1,5 l
- Traction hoist: M500 / M508
- Specification: MSHC 632 VG320

Each oil has to be verified by AVANTI.

#### 6.4.6 Overload check and adjustment

Annual test:

Test switches and perform overload test as specified in the "Appendix A: Regulation of overload limiter".

### 6.5 Information signs and documents

Verify availability and legibility of all data plates and information signs. Replace missing or illegible plates and signs!

### 6.6 Ordering spare parts

Only use original parts.

Spare part lists are available from AVANTI. Please indicate lift model when requesting a spare part list.

